INTERNATIONAL
SPACE
SCIENCE
INSTITUTE

2015/2016 Annual Report

Imprint

Publisher
International Space Science Institute
Hallerstrasse 6
CH-3012 Bern
Switzerland
Tel.: +41 31 631 48 96
Fax.: +41 31 631 48 97
E-mail: info@issibern.ch
Internet: www.issibern.ch

Cover/Editor/Concept/Layout
Andrea Fischer

Printed by
Länggass Druck AG
Länggassstr. 65
3000 Bern 9
Switzerland

Cover Page

Puzzle composed of six images (from the upper left to the lower right):

1. NASA's Spitzer and Hubble Space Telescopes have teamed up to expose the chaos that baby stars are creating 1,500 light years away in a cosmic cloud called the Orion nebula (NASA/JPL-Caltech/STScI).

2. This multicolored swirl of yellow and blue shows a prominent ring of gas near the North Celestial Pole (ESA and the Planck Collaboration).

3. Image of a pair of interacting galaxies called Arp 273 (NASA, ESA and the Hubble Heritage Team (STScI/AURA)).

4. ESA astronaut Tim Peake shared this image, commenting: "Every so often our orbit lets us enjoy a longer sunrise and sunset - more time to capture the spectacular colors!" (ESA/NASA).

5. Artist rendition of the formation of rocky bodies in the solar system - how they form and differentiate and evolve into terrestrial planets like Mars (NASA/JPL-Caltech).

6. The Sun as seen through SOHO's LASCO C2 telescope on December 2, 2015, the 20th anniversary of the satellite's launch SOHO (ESA/NASA).

Table of Contents

The International Space Science Institute (ISSI) is an Institute of Advanced Studies where scientists from all over the world meet in a multi- and interdisciplinary setting to reach out for new scientific horizons. The main function is to contribute to the achievement of a deeper understanding of the results from different space missions, ground based observations and laboratory experiments, and adding value to those results through multidisciplinary research. The program of ISSI covers a widespread spectrum of disciplines from the physics of the solar system and planetary sciences to astrophysics and cosmology, and from Earth sciences to astrobiology.

From the Chairman of the Board of Trustees

In March 2016, I took over the chairmanship of the ISSI Board of Trustees (BoT) from my predecessor, Urs Würgler, who died prematurely in November 2015. ISSI is saddened by this untimely loss and extremely grateful for Urs Würgler's very positive initiatives during his far too short term as chair of the BoT. ISSI thanks Rosine Lallement, who accepted to chair the BoT during the necessary interim period.

More than ever, ISSI is characterized by its outstanding scientific activities. Its worldwide reputation is the direct result of the dedication and commitment of its directorate and staff. It is worth mentioning some of the highlights in this report, which covers the 21st ISSI business year, from 1 July 2015 to 30 June 2016.

The extension of the agreement of cooperation between ISSI and the National Space Science Center of the Chinese Academy of Sciences (NSSC/CAS) was signed in October 2015, as approved by the BoT during its meeting in July 2015. The collaboration between the Institute of Space and Astronautical Sciences of the Japan Aerospace Exploration Agency (ISAS/JAXA) and ISSI has been further developed. Although already implemented, the formal agreement will be signed by the end of 2016.

During its June 2016 meeting, the BoT unanimously extended the contract of Rafael Rodrigo for a new term as ISSI Executive Director, from January 2017 until January 2021. In March 2016, Daniel Neuenschwander was appointed as new ESA Director of Launchers. As the Head of the Swiss Space Office (SSO) and Swiss Delegation to ESA, in the framework of the State Secretariat for Education, Research, and Innovation (SERI), Daniel Neuenschwander was de facto a member of the BoT. We congratulate him for his new important position and thank him for his essential support to ISSI. We welcome to the BoT, his successor, Renato Krpoun, who is the new head of the SSO and Swiss Delegation to ESA.

It is a great pleasure to thank the ISSI directorate and staff for their excellent work. Many thanks to all the members of the Science Committee and of the BoT for their numerous activities and support. ISSI is also very grateful to all its funding agencies, national and international. At the beginning of this term, my sincere hope is that ISSI will be in a position to broaden further its scientific activities through the simultaneous increase of the number of its funding agencies and of their financial support.

Georges Meylan

Lausanne, August 2016

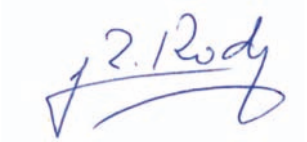
The twenty-first year of ISSI was overshadowed by the untimely demise of our former President, Urs Würgler, who passed away after a severe, short illness on November 16, 2015. His Presidency was much too short and yet he has advanced ISSI substantially with his clear directive and his open mind. He will be remembered with gratitude in the annals of the Institute. We are equally grateful to the Vice President, Rosine Lallement, for taking the helm in the time of crisis, for chairing two Board meetings and a search committee for a new President, and for completing this task in record time with the election of Georges Meylan. We are very happy to collaborate with our new President and look forward to a long and prosperous term of office.

The ISSI Science Committee has held its meeting in May 2016 at ISSI-Beijing for the first time. This was also the last meeting chaired by Tilman Spohn, who had been elected chair back in 2012. We thank him very warmly for his excellent service and welcome his successor, Mioara Mandea, with whom we look forward to collaborating over the forthcoming years and thank her and all committee members for their dedication to ISSI.

During the twenty-first year there were five Workshops, among which the first one in collaboration with the ESA High Level Science Policy Advisory Committee (HISPAC) on high-performance clocks, three Working Groups initiated their activities, two Forum meetings, and 63 International Team meetings, are all described in more detail in the subsequent pages. Together they brought us 927 visitors, 40.8% of which were visiting for the first time. The publication record has also grown steadily, this time by four volumes in the Space Sciences Series of ISSI, and the impact factor of Space Science Reviews has increased to a new all-time high of 7.24, placing the journal as #6 in the list of more than 60 astronomy journals as evaluated by Thomson Reuter's Web of Science.

Several new partnerships were established in the past year: After the success of the EuroPlanet proposal, whose implementation is about to start with a Forum for the definition of Workshop themes, ISSI has become a partner in a second successful proposal to the H2020 call of the European Commission, namely MiARD (Multi-instrument Analysis of Rosetta Data). Our roles in this three-year project will be to work on the dust properties and a new dust ejection model aimed as input for improving the ESA IMEX (Interplanetary Meteoroid Environment for Exploration) model, as well as to conclude the project with a Workshop and publication in the ISSI series. Due to the special relationship of Switzerland to the European Community both the EuroPlanet and MiARD project had to be reproposed after acceptance by the EC to the Swiss Confederation for funding. We are happy to report that this extra round of bureaucracy was ultimately successful. Moreover, a new international partnership with Japan's ISAS/JAXA was established that will facilitate the participation of Japanese scientists in ISSI activities.

After six years at ISSI our main secretary Jennifer Fankhauser gave birth to a baby daughter Lara in April 2016 and decided to leave ISSI for her family. We thank her for her outstanding work and welcome her successor, Alexandra Lehmann, who has joined us in March for a very smooth transition. The transition will be made even smoother by the return of Jennifer Fankhauser as a part-time secretary in September 2016, replacing Greta Kurpicz who will leave us for taking up study at the University of Zurich. We thank her for the two years of service and wish her all the best for the future. Our two postdocs are also about to leave ISSI after the completion of their contracts. We thank Veerle Sterken and Nicolas Champollion for their work and their contributions to science under the ISSI affiliation. The two postdoc positions have again been advertised and by the deadline some 77(!) applications have been received, providing another clear sign of ISSI's popularity and success.

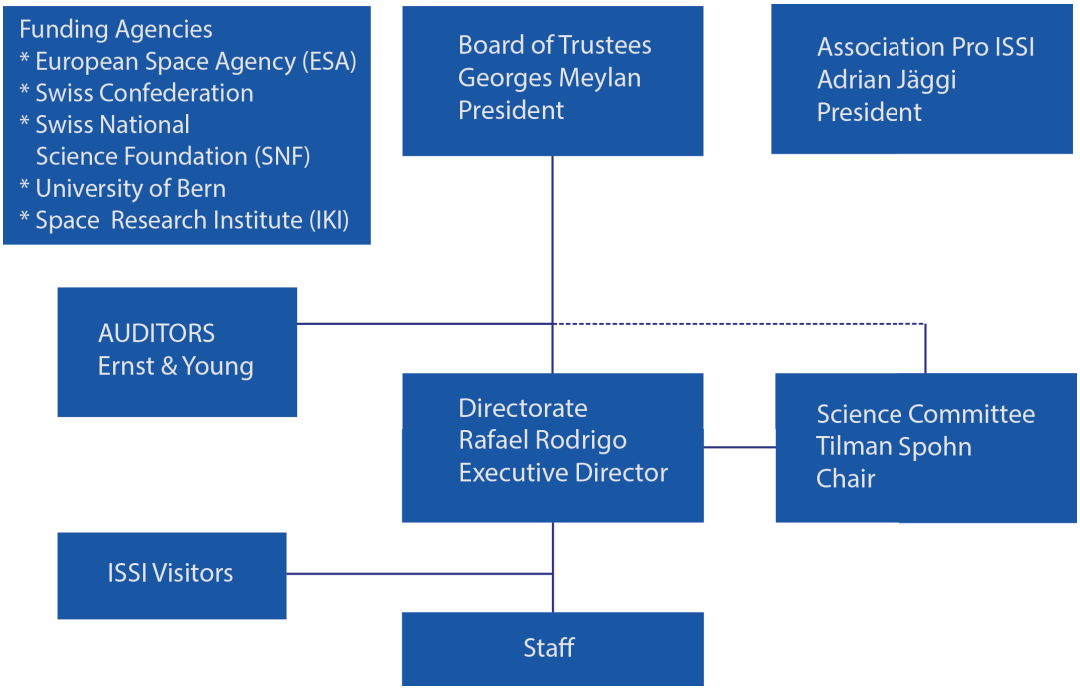

Rafael Rodrigo


Rudolf von Steiger


Anny Cazenave


John Zarnecki

About the International Space Science Institute



The International Space Science Institute (ISSI) is a nonprofit organization set up in Bern in 1995 as a foundation under Swiss law with an endowment by Contraves Space AG, later renamed Oerlikon Space AG and now part of RUAG. Three statutory bodies govern ISSI: the Board of Trustees, the Directorate, and the Science Committee. A fourth important body, the Association Pro ISSI, promotes the idea of ISSI, especially within Switzerland.

The European Space Agency (ESA), the Swiss Confederation, and the Swiss National Science Foundation (SNF) provide the financial resources for ISSI's operation. The University of Bern contributes through a grant to a Director and in-kind facilities. The Space Research Institute (IKI) is supporting ISSI with an annual financial contribution. Details can be found on page 10. ISSI received tax-exempt status from the Canton of Bern in May 1995.

ISSI's **Board of Trustees** oversees the work accomplished at the Institute, exerts financial control, and appoints the Directors and members of the Science Committee. It consists of representatives of the Founder, and of the funding Institutions. Furthermore the Board of Trustees may nominate up to five personalities representing the national and international science community, space industry and space politics for terms of three years. The Board of Trustees is presided over by Georges Meylan.

The **Science Committee**, chaired by Tilman Spohn, is made up of internationally known scientists active in the fields covered by ISSI. The Science Committee advises and supports the Directorate in the establishment of the scientific agenda providing a proper equilibrium among the activities and reviews and grades the Team proposals in response to the annual call. Science Committee members serve a three year term (with a possible extension of one year).

The **Directorate** is in charge of the scientific, operational, and administrative management of the Institute. It interacts with the Funding Agencies, the Swiss authorities, the Board of Trustees, the Science Committee and the Association Pro ISSI. The Directorate consists of Rafael Rodrigo (Executive Director), Rudolf von Steiger (University of Bern), Anny Cazenave (CNES, Toulouse, France) and John Zarnecki (The Open University, Milton Keynes, UK).

The **Association Pro ISSI**, founded in spring 1994, counts about 130 members. Pro ISSI promotes the idea of ISSI by organizing public lectures, where internationally known scientists introduce their results. Summaries of these talks are published in the journal SPATIUM. Member benefits include invitations to lectures and a free subscription to SPATIUM. The Board of the Association Pro ISSI is presided over by Adrian Jäggi.

The Board of Trustees

from left to right:
Secretary of the Board: Rudolf von Steiger, International Space Science Institute, Bern, Switzerland
André Maeder, Observatoire de Genève Sauverny, Switzerland
Willy Benz, University of Bern, Switzerland
Chairman: Georges Meylan, Ecole Polytechnique Fédérale de Lausanne, Switzerland
Lev M. Zelenyi, Space Research Institute (IKI), Russian Academy of Sciences, Moscow, Russia
Alvaro Giménez, ESA, Paris, France
Johan A.M. Bleeker, SRON, Utrecht, The Netherlands
Adrian Jäggi, President of the Pro ISSI Association, Bern, Switzerland
Lennard A. Fisk, University of Michigan, Ann Arbor, USA
Sergio Volonté, Science and Robotic Exploration Directorate, ESA, Paris, France - retired
Daniel Neuenschwander, Swiss Space Office, Bern, Switzerland

missing from the picture:
Vice Chairman: Rosine Lallement, Observatoire de Paris-Meudon, France
Daniel Fürst, RUAG, Zurich, Switzerland
Jean-Pierre Swings, Université de Liège, Belgium
Ji Wu, National Space Science Center (CAS) and International Space Science Institute Beijing, China

The Science Committee

from left to the right:
Xiaolong Dong, International Space Science Institute Beijing, Beijing, China (ex officio)
Lennart Bengtsson, University of Reading, United Kingdom
Rumi Nakamura, Space Research Institute, Graz, Austria*
Masaki Fujimoto, Japan Aerospace Exploration Agency, Sagamihara, Japan
Lidia van Driel-Gesztelyi, MSSL, University College London, Dorking, United Kingdom
Luisa M. Lara, Instituto de Astrofisica de Andalucia, CSIC, Granada, Spain
Vladislav Izmodenov, IKI, Russian Academy of Sciences, Moscow, Russia (ex officio RAS)
Marco Velli, NASA Jet Propulsion Laboratory, Pasadena, USA*
Chairman: Tilman Spohn, German Aerospace Center (DLR), Berlin, Germany*
Athéna Coustenis, Observatoire de Paris-Meudon, France
Richard Marsden, ESTEC ESA, Noordwijk, The Netherlands*

missing from the picture:
Andrei Bykov, Russian Academy of Sciences, St. Petersburg, Russia
Mioara Mandea, CNES, Paris, France
Mark McCaughrean, ESTEC ESA, Noordwijk, The Netherlands (ex officio ESA)
Michael Rast, ESA ESRIN, Frascati, Italy (ex officio ESA)
Nathan Schwadron, University of New Hampshire, Durham, USA
Luigi Stella, INAF, Rome, Italy*
Stéphane Udry, Department of Astronomy, University of Geneva, Switzerland

* Membership ended on 30 June 2016

from left to the right:
Maurizio Falanga, Science Program Manager
Roger-Maurice Bonnet, Senior Discipline Scientist
Nicolas Champollion, Post Doctoral Scientist
Rudolf von Steiger, Director
Veerle Sterken, Post Doctoral Scientist
Rafael Rodrigo, Executive Director
Saliba F. Saliba, Computer Engineer and System Administrator
Silvia Wenger, Assistant to the Executive Director
Vittorio De Falco, PHD Student
Alexandra Lehmann, Secretary
Andrea Fischer, Editorial Assistant
Irmela Schweizer, Librarian

missing from the picture:
Anny Cazenave, Director
John Zarnecki, Director
Michel Blanc, Discipline Scientist
Andrei Bykov, Discipline Scientist
Johannes Geiss, Honorary Director
Jennifer Fankhauser, Secretary
Greta Kurpicz, Part-Time Secretary

All lists show the status at the end of the 21st business year on 30 June 2016.

Financial Overview

The 21st financial year of ISSI resulted in a deficit of about 169 kCHF, as opposed to a budgeted deficit of 245 kCHF. Once again the chief uncertainty in the budget was the exchange rate of the Euro to the Swiss Franc, which in the last twelve months has developed somewhat more favorably than anticipated. The deficit is fully covered by positive results from previous years, specifically from an unexpected payment from the Swiss Confederation for helping to compensate the declining exchange rate of the Euro.

On the revenue side the contributions from ESA (Directorates of Science and of Earth Observation as well as HISPAC) and from the Swiss Confederation were received as budgeted and are gratefully acknowledged. In addition a contribution was received for the first time from our new partner, JAXA/ISAS, as mentioned earlier in this report. On the expense side all items were close to the budgeted values, which is a good sign for the smooth operation of the institute.

In addition to the direct contributions listed here it is important to note that ISSI also receives indirect contributions that do not appear in the table below: One of the directors is employed directly by the University of Bern, and ISSI also benefits from the University through in-kind contributions such as Internet connectivity etc.

Rudolf von Steiger

Statement of Operations (in CHF) for the 21st Financial Year (1.7.2015-30.6.2016)

	Expenses	Revenues	
ESA Science Directorate		1'355'780.10	*Audited by Ernst & Young, Bern*
ESA Earth Observation Programme		322'858.50	
ESA HISPAC		50'000.00	
Swiss Confederation		940'000.00	
EuroPlaNet, MiARD Projects		0.00	
ISSI Partners		27'515.00	
Other income or cost [3]	14'860.66		
Salaries and related costs [1]	1'328'403.95		
Fixed costs	285'252.35		
Operating costs [2]	215'074.75		
Investment (depreciated)	12'586.51		
Workshops, Working Groups, Teams, Visitors (ISSI funded) [4]	1'008'588.09		
Result of the Year		168'612.71	
Subtotal	**2'864'766.31**	**2'864'766.31**	
Swiss National Science Foundation (SNF) [5]		193'270.80	*Audited by SNF*
Workshops, Working Groups, Teams, Visitors (SNF funded)	193'270.80		
Total	**3'058'037.11**	**3'058'037.11**	

Remarks:

[1] **Salaries:** It should be noted that the majority of the ISSI staff members (including directors) are scientists actively conducting research as well as taking care of organizational, editorial, and administrative tasks.

[2] **Operating costs** include repair and maintenance, insurance, supplies, administration, and public relations.

[3] **Other income** includes extraordinary income, interest income, and exchange gain or loss.

[4] **Workshops, etc.** also include the balance from income and expenses of guest apartments.

[5] **SNF:** Grant from Swiss National Science Foundation to R. von Steiger and related expenses.

The Pro ISSI Association was founded in 1994 under Swiss law with the goals to create a Space Science Institute in Switzerland, and to communicate the fascinating results of space sciences to the Swiss public. With the creation of the Foundation International Space Science Institute (ISSI) in 1995 the first objective had been reached. Pro ISSI focuses now on providing a bridge between leading space scientists and its members, representing universities, industry, politics and public administration. The Association offers public lectures on new insights in space science, and publishes 2-3 SPATIUM issues per year. The Pro ISSI Association, which counts presently 133 members, meets once per year for its general assembly. The Board of Pro ISSI consists of Adrian Jäggi (President), Hansjörg Schlaepfer (Editor Spatium), Frank Rutschmann (Treasurer) and Silvia Wenger (Secretary).

Public Lectures

Pro ISSI organized three public lectures in the period of this report:

The General Assembly was held on 28th October 2015 followed by a lecture by ISSI Director John Zarnecki. He spoke about "Titan; The Moon that thinks it's a Planet". Based on the landing of the Huygens probe and more than 100 flybys of the Cassini spacecraft the presentation highlighted the current knowledge of the only moon in our Solar System with a significant atmosphere.

On 2nd March 2016, George Gloeckler from the University of Michigan and first Johannes Geiss Fellow spoke about "Exploring our Solar System Perimeter from within and afar". This presentation discussed how the perimeter region is being explored both from within, by charged particle instruments on-board the Voyager spacecraft, and from afar by neutral atoms cameras on Earth orbiting satellites.

On 8th June 2016, Hermann Lühr from the Deutsches GeoForschungszentrum Postdam, Germany was foreseen to give a talk on "The new magnetic picture of the world: What tell us the CHAMP and Swarm satellites?". Unfortunately it was not possible for Hermann Lühr to come to Bern. Instead Nicolas Thomas from the University of Bern and former Pro ISSI president could step in and gave a talk about "CaSSIS – A Swiss Camera goes to Mars", where he informed the audience about the successful launch of the ExoMars Trace Gas orbiter and the planned operation of the high resolution, stereo imaging system CaSSIS developed at the University of Bern.

Covers of the SPATIUM No. 36 and 37 published in the 21st ISSI Business Year.

SPATIUM

The Association's magazine SPATIUM elaborates on selected lectures offered by Pro ISSI. It appears twice to three times per year. During the reporting period, issue no. 36 was published in November 2015, reporting on the Origin and Evolution of Planetary Atmospheres. Helmut Lammer from the Space Research Institute of the Austrian Academy of Sciences outlined the most important processes responsible for the formation and evolution of planetary atmosphere and highlighted their key role in allowing life to emerge on our planet or any other habitable worlds beyond ours. In contrast, issue no. 37, published in May 2015, reports on the Violent Universe. The author, Thierry Courvoisier from the Integral Science Data Centre, University of Geneva, highlighted the contributions that high energy astronomy had made to our understanding of the Universe, especially thanks to the long mission duration of ESA's INTEGRAL satellite.

These publications together with all previous issues of SPATIUM can be found on Pro ISSI's homepage www.issibern.ch/publications/spatium.html.

Adrian Jäggi

Scientific Activities: The 21st Year

The Program and the Tools

ISSI's mode of operation is generally fivefold: multi- and interdisciplinary Workshops, Working Groups, International Teams, Forum, and Visiting Scientists. In the 21st business year a total of 927 international scientists participated in the scientific activities of ISSI.

Workshops consist of up to 50 invited scientists exchanging their views on a scientific theme, typically during a week's duration. Workshops always lead to a volume of the Space Science Series of ISSI and in parallel as issues of Space Science Reviews or Surveys in Geophysics. In the 21st year five Workshops were organized, summaries of which can be found on the following pages.

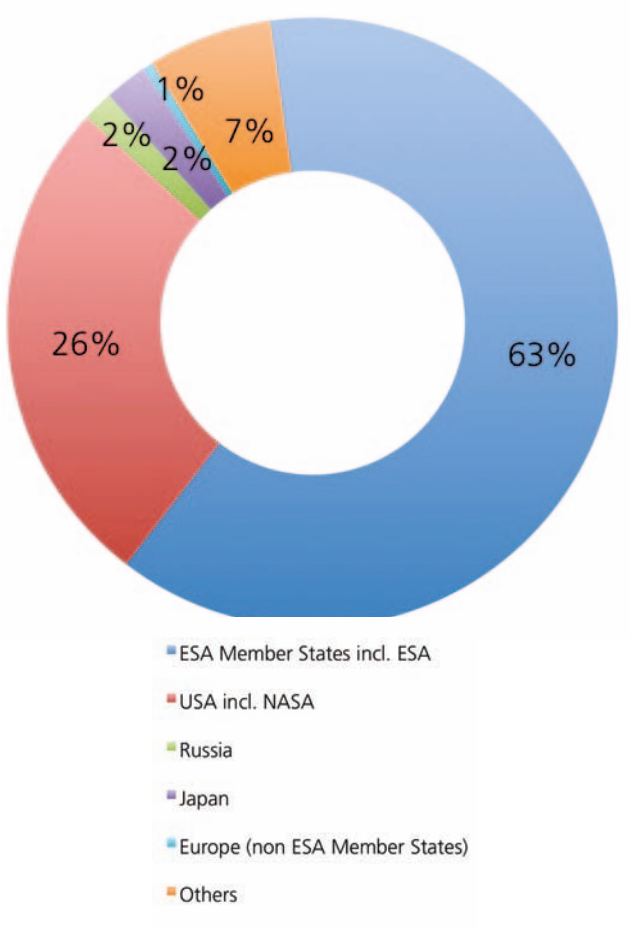
Working Groups have a smaller number of members and meet repeatedly as necessary to achieve the assigned objective. The results of the Working Groups activities are in general published as titles of ISSI Scientific Report Series. In the course of the 21st business year three new Working Groups started their activities.

International Teams consist of about 15 external scientists, addressing a specific scientific topic in a self-organized fashion. The results of these activities are customarily reported in scientific journals. In total 63 Team meetings took place in the 21st business year. Details can be found from page 23 on.

A Forum is an informal and free-ranging debate consisting of some 25 high-level participants on open questions of a scientific nature or on science policy matters for about two days. A Forum does not necessarily lead to formal recommendations or decisions. In the 21st business year two Forums were held.

Visiting Scientists spend variable periods of scientific activity at ISSI. 10 individual visitors used the ISSI facilities during the year.

The Young Scientists Program is designed to bring PhD students and young post docs in contact with the community at work. These young scientists are invited by ISSI to complement the membership of Workshops, Working Groups, International Teams and Forums. 111 young scientists participated in the ISSI activities in the course of the 21st year.



Pie chart showing the ISSI visitors countries of origin. A total of 927 scientists worked at ISSI during the 21th business year, 378 of them were here for the first time.

How to use ISSI tools

As a general rule participation in ISSI's activities is by invitation only. The financial support for invited scientists covers the local accommodation expenses and a per diem while in Bern.

International Teams: A call for proposals is released every year in January. These proposals are evaluated by the ISSI Science Committee and approved by the Directorate.

Workshops, Working Groups, and Forums: There is no annual call. The scientific community may suggest at any time Workshops, Working Groups, and Forums by submitting an idea on a maximum of one page. The ISSI Science Committee will evaluate these suggestions and the ISSI Directorate will take a final decision.

Performing High-Quality Science on CubeSats

19 - 20 January 2016

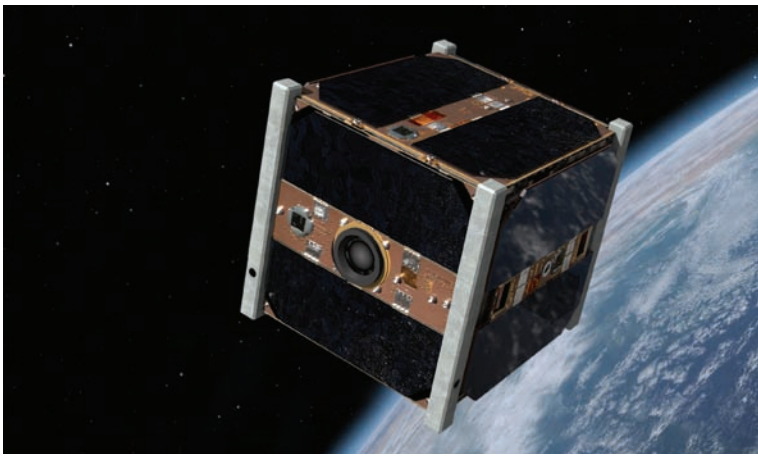
Forums are informal and free-ranging debates among some twenty-five high-level participants on open questions of a scientific nature or on science policy matters. Forums do not necessarily lead to formal recommendations or decisions.

Opportunities to perform high-quality science in space are limited by both budget and the historical trend of increasing mission cost and development time. The recent proliferation of CubeSats, enabled by an easing of access to space and their low cost nature raises the question as to how such platforms can be used to perform high-quality science in space.

A CubeSat is a class of spacecraft that is deployed in-orbit from a container by an ejector system that is installed in a variety of launch vehicles, creating faster access to space for relatively small spacecraft, constrained by the container. The spacecraft volume is typically an integer number of litres, termed units (u), allowing multiple spacecraft whose total volume equals that of the container. A benefit of this spacecraft design philosophy is that CubeSats can have a shorter development life-cycle, be of lower cost, enable constellations of small spacecraft, and be developed by a small collocated team that embraces a higher level of risk than traditional space missions.

This is why CubeSat launches have grown almost exponentially over time. To date, the vast majority of CubeSat missions have been technology focused. As these technologies mature, scientific opportunities are emerging from Earth sciences to solar and space physics, and from astrophysics, to planetary sciences. Also, there may be significant possibilities in Earth observation, including those enabled by multi-point sampling of atmospheric and ionospheric parameters and remote sensing observations of the Earth's surface.

In January 2016 ISSI hosted a two-day Forum to focus on the rapid evolution of CubeSats as an enabling technology platform, with special emphasis on their promise to perform high-quality science. The Forum was initiated in coordination with a then ongoing, and recently published study performed by the US National Academies on the same topic (goo.gl/osCSQ3), and was focused on the international context of CubeSats-enabled science. The Forum gathered some 30 scientists who addressed the very diverse aspects of CubeSats, from single units



Swisscube, developed by EPFL's Space Center, is a typical CubeSat-type satellite. Launched in 2009 it is still orbiting the Earth and tracked continuously. (Image Credit: EPFL)

tracking migratory birds, pairs investigating the radiation belt, small groups testing constellation technology, up to a fleet of nearly fifty to investigate the otherwise inaccessible lower thermosphere.

The resulting report, published in Space Research Today, summarizes the conclusions from this Forum to inform the growing international community of the activities in this area of research. Our discussions focused on four themes characteristic of CubeSats and their evolution: 1) identification of appropriate science in a variety of research disciplines, 2) technology development, 3) international vs. national approaches, and 4) educational benefits. These are followed by a few Appendices, each describing a concrete and illustrative example of a national or international engagement with science-focused CubeSats, or their enabling technologies.

Rudolf von Steiger

VARSITI Variability of the Sun and Its Terrestrial Impacts

1 - 3 March 2016

SCOSTEP (Scientific Committee On Solar-Terrestrial Physics) is a scientific committee of the International Council for Science (ICSU). One of its main functions is to run long-term (4-5 years) international interdisciplinary scientific programs in solar terrestrial physics. SCOSTEP's current 5-year (2014-2018) scientific program is VarSITI - Variability of the Sun and Its Terrestrial Impacts, http://varsiti.org/. VarSITI has 4 scientific projects: SEE (Solar Evolution and Extrema), ISEST/MiniMax24 (International Study of Earth-affecting Solar Transients), SPeCIMEN (Specification and Prediction of the Coupled Inner-Magnetospheric Environment), and ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate). A common problem for the last three projects is the expected evolution of solar activity. Our present knowledge of the terrestrial system and its response to solar activity is based on instrumental data gathered during the "space era" which happened to be entirely in a period of a "Grand Maximum" of solar activity, and it is not clear whether it will remain valid in periods of very low or even moderate activity. After the prolonged and very deep minimum between sunspot cycles 23 and 24, and the very low cycle 24, it is believed that the recent Grand Maximum has come to an end. But we don't know what follows: a "normal" centennial minimum with a couple of cycles with low amplitude, like the one in the beginning of the 20th century, or a deep minimum like the "Maunder minimum" in the second half of the 17th century when almost no sunspots were observed for several decades. This question: "Are we at the verge of a new grand minimum? If not, what is the expectation for cycle 25?", is the first one posted to VarSITI's project SEE.

A joint ISSI/VarSITI SEE brain-storming forum was held in Bern from 1 to 3 March, to assess this question. 18 scientists presented their forecasts based on different approaches: from the solar dynamo theory, to data assimilation and statistical approaches, and to early indicators of the forthcoming cycle. After 3 full days of intense discussion, the participants did arrive at some conclusions: Forecasts for more than one or two cycles ahead are not reliable. The expectations for the next two cycles are that they will not be high, but not a beginning of a grand Maunder type minimum. It is most likely that cycle 25 will be of the same height as cycle 24, and the next one may be a bit lower.

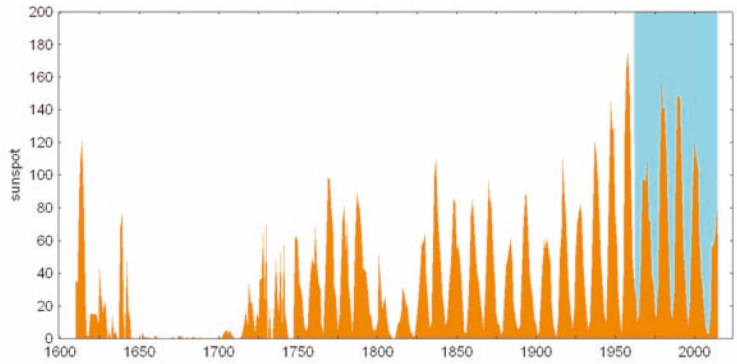


Figure illustrating the long-term evolution of solar activity. The shading denotes the "space era". The number of sunspots until 1995 is based on the group sunspot number (Hoyt and Schatten, 1995) complemented by the International sunspot number from www.sidc.be/silso/versionarchive. (Figure composed by K. Georgieva)

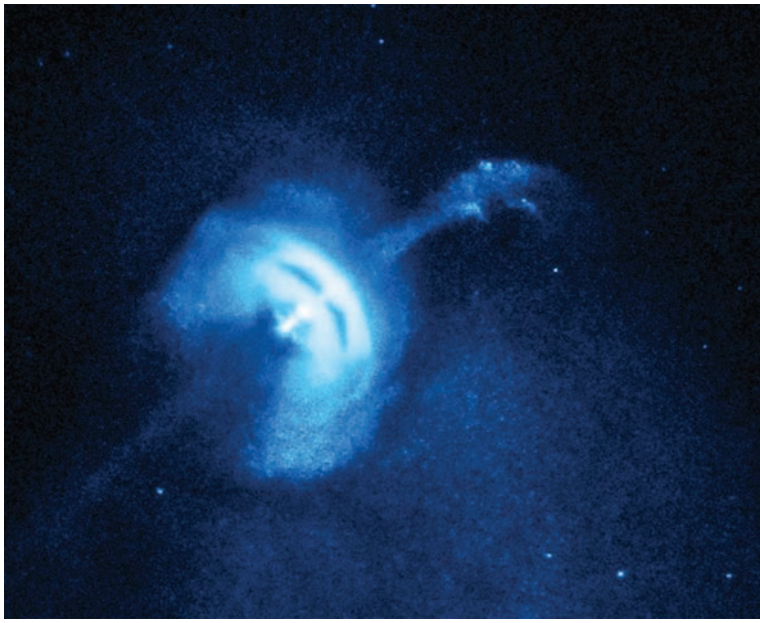
Papers based on the presentations during the ISSI/VarSITI joint forum will be published in a special issue of JASTP (http://www.journals.elsevier.com/journal-of-atmospheric-and-solar-terrestrial-physics/call-for-papers/special-issue-on-expected-evolution-of-solar-activity-in-the). The issue is open to also other contributions related to the topic.

Katya Georgieva

Workshops are selected by the Directorate in consultation with the Science Committee. Proposals or suggestions for Workshops may originate from the external community. The program and speakers are defined by a group of experts serving as conveners. The Workshops can be attended by up to 50 invited scientists. Workshops always lead to a volume of the Space Sciences Series of ISSI (SSSI) published by Springer and in parallel as issues of Space Science Reviews or Surveys in Geophysics.

Jets and Winds in Pulsar Wind Nebulae and Gamma-ray Bursts

16-20 November 2015



The star of this movie is the Vela pulsar, a neutron star that was formed when a massive star collapsed. The Vela pulsar is about 1,000 light years from Earth, spans about 12 miles in diameter, and makes over 11 complete rotations every second, faster than a helicopter rotor. (Image Credit: NASA/CXC/Univ. of Toronto/ M.Durant et al)

The 40 workshop participants (including 5 young scientists) from 12 countries discussed in-depth the complex and multi-scale fundamental studies of astrophysical objects with extreme energy release via multi-wavelength observations and modeling. The compact stellar remnants of supernovae fast rotating black holes and neutron stars – are able to give rise, with their ultra-relativistic jets and winds, to the rapid release of a large amount of energy, such as observed in gamma-ray bursts and soft gamma-ray repeaters, as well as long-lasting, quasi-steady, high energy sources such as pulsar wind nebulae. The extreme energy release which occurs in the vicinity of a massive black hole produces highly non-thermal beamed radiation of blazars.

Complex studies of these objects allow the addressing of a number of fundamental problems, such as the physical mechanisms and efficiencies of conversion of the rotation and magnetic energies of the central engine into the observed electromagnetic radiations and neutrinos, the launching of relativistic outflows, and the acceleration of ultra-relativistic particles. Multi-wavelength observations of gamma-ray bursts were reviewed by R. Willingale and discussed in the frame of different models by P. Meszaros, F. Daigne, T. Piran, A. Beloborodov and K. Asano. Soft gamma-ray repeaters are related to magnetars – objects with the highest ever magnetic fields; these were discussed by S. Mereghetti and R. Perna. Observations and current models of pulsar wind nebulae were presented by S. Reynolds, G. Pavlov, M. Tavani, O. Porth, R. Buehler, and S. Komissarov. Multiwavelength observations and phenomenolgy of blazars and micro-quasars were reviewed by S. Markoff, M. Boettcher, and G. Romero. The physics of relativistic outflows and jet formation was presented by G. Pelletier, A. MacFadyen, L. Sironi, M. Pohl and A. Tchekhovskoy. The general concept of magnetoluminescence was presented by R.D. Blandford. Extreme physical conditions that are present in these objects are unreachable in terrestrial laboratories and therefore these sources provide a unique opportunity to test physical laws under extreme conditions.

The workshop conveners were A.M. Bykov (Ioffe Institute and ISSI), E. Amato (INAF, Osservatorio Astrofisico di Arcetri, Italy), J. Arons (University of California, Berkeley, USA), M. Falanga (ISSI), M. Lemoine (University Pierre et Marie Curie, Paris, France), and L. Stella (INAF, Osservatorio Astronomico di Roma, Italy).

Andrei Bykov

Workshops

High Performance Clocks, with Special Emphasis on Geodesy and Geophysics and Applications to Other Bodies of the Solar System

30 November - 4 December 2015

This Workshop was held in collaboration with ESA's High Level Science Policy Advisory Committee (HISPAC). The broad objectives as proposed following the ISSI-HISPAC Forum on "Understanding Gravity" in December 2013 were to Explore new technologies and technology transfer across disciplines and to bring together a wide range of expert participants in order to consider novel applications of the new generation of high performance space clocks in the fields of Earth Sciences, Fundamental Physics, Solar System Science and Astrophysics & Cosmology.

The Conveners of the Workshop were V. Dehant, L. Gurvits, M. Kramer , R. Park, P. Wolf and ISSI Directors R. Rodrigo and J. Zarnecki.

The Workshop was divided into 5 broad sections, namely (i) Clocks, Time Transfer & Technology, (ii) Applications in Earth Sciences, (iii) Applications in Fundamental Physics, (iv) Applications in Solar System Science and (v) Astrophysics and Cosmology.
Nearly 40 presentations were given with time allocated also for general discussions. In addition, Introductory Talks were given by Rafael Rodrigo (Executive Director, ISSI) and Chris Rapley (Chair, HISPAC). Furthermore, an Introductory General Lecture "Cosmic time and Einstein's universal antigravitation" was given by Arthur Chernin.

In the area of technology, a distinction emerged between "small" and "bulky" space-based clocks. As far as the future is concerned, there was a consensus that this will likely see an improvement in the performance of "bulky" space clocks and may be some further "miniaturizing" of "small" ones but yielding only modest performance improvements. Conversely, for ground-based clock performance, there seems to be no agreed limit for future performance.

Significant progress was envisaged in Earth Science applications in the following areas, namely high resolution local geopotential field mapping and related geophysics, the unification of existing, separate world-wide height systems and sea level monitoring, low spatial resolution, but high temporal resolution on a global scale and formation flying geodesy missions.
Conversely, it was not felt that significant progress would be made by the development of clock applications in the field of global navigation satellite systems, where clock technology is not currently the limiting factor.

As far as applications in Fundamental Physics were concerned, promising applications of ground clocks and "bulky" space clocks are foreseen in applications such as tests of the Einstein Equivalence Principle (EEP) and the gravitational redshift and tests of the Shapiro time delay of light passing near a massive body. It seemed to be the consensus of those in the field that the EEP will be violated at some level – but there is no agreement as to what this level will be, and which aspect of EEP will first show a violation.

In Applications in Solar System Science, it was emphasized that the issues of resources (i.e. mass, power and compactness) are the most challenging. However, "Small" space clocks may be the solution. Various potential applications were aired and the most promising were identified as formation flying planetary gravity missions and operational facilitation of deep space tracking, and the possible use of one-way data.

In the Astrophysics and Cosmology domain, it was generally agreed that at present, clocks and oscillators are not on the "critical path" for the majority of space-based developments.

However, in at least four areas, discussions identified the development of advanced high precision clocks, including space-qualified versions, as synergistic to astronomy and cosmology in a broad context. These included (i) sub-micro-arc-second astrometry; (ii) advanced mm- and sub-mm VLBI; (iii) pulsar timing and its scientific applications in cosmology, astrophysics and fundamental physics and (iv) space VLBI (including ad hoc "opportunistic" applications of VLBI-built payloads for non-VLBI applications, e.g. EEP tests).

John Zarnecki

Participants in the Workshop on "the Delivery of Water to Proto-planets, Planets and Satellites"

The Delivery of Water to Proto-planets, Planets and Satellites

11-15 January 2016

The Workshop gathered 51 scientists, including 6 young scientists who were given an opportunity to present their current work in a special session.

This Workshop was the second in the series of three "Exoplanet Science" workshops recommended at the end of 2012 by the ISSI-Europlanet Forum on "The Science of Exoplanets and their Systems". Its objective was to address a key science question which is central in the quest for possible alien life, namely from where and how does water come to planets, and how does it possibly escape from them? Indeed, since the presence of liquid water is one of the three basic conditions for the development of life as we know it, searching for water reservoirs in and on planetary objects is a prerequisite for searching for life.

In a first set of sessions, the Workshop described our present knowledge of the presence of water, first in circumstellar nebulae, and then in the different types of planetary objects in the solar system and beyond. This review showed that the presence of water is more common than was thought a few decades ago across the broad diversity of planetary objects. In the following sessions, the Workshop described the fate of water in the context of planetary formation scenarios. Finally, the last sessions described what happens to water once it is integrated into planetary and satellites bodies, including the acting escape processes which sometimes lead to dry worlds like Venus.

This Workshop will lead to the publication of a SSSI book which is in preparation now and will be published by mid 2017. It will comprise fifteen chapters narrating the fate of water on planets and telling us how and for how long planetary objects may become habitable.

Michel Blanc

Workshops

Shallow Clouds, Water Vapor, Circulation and Climate Sensitivity

8-12 February 2016

The WCRP (World Climate Research Program) Grand Challenge on Clouds, Circulation, and Climate Sensitivity has identified four questions with the potential to accelerate progress in understanding the Earth system and anticipating global and regional climate changes. Two questions are related to how clouds mediate the strength and intensity of large-scale rainfall maxima in the tropics and mid-latitudes. The other two are focused on the role of cloud-scale processes in climate, particularly at low latitudes where cloud-environment interactions have a large impact on climate and its sensitivity to forcing. The question "What role does convective aggregation play in climate?" links observed and modeled relationships between the degree of convective organization and the distribution of clear-sky humidity, on the one hand, to the temperature dependence of convective self-aggregation in models, on the other, suggesting an unexplored feedback of convective organization on climate sensitivity. The question "What role does convection play in cloud feedbacks?" focuses on the role of tropical deep convection in setting the atmospheric conditions to which climatically-important shallow clouds are exquisitely sensitive, on how the response of these clouds to changes to this environment may be linked to climate sensitivity, and how this response is mediated by somewhat deeper precipitating shallow convection. One common thread in these questions is the need to better understand the environmental conditions that control shallow clouds. The two most important conditions are the large-scale vertical velocity and, especially in the lowest portion of the atmosphere, the distribution of water vapor. Dynamics in the Tropics cannot support large temperature gradients so water vapor is the dynamically-relevant variable controlling, for example, the timing and intensity of deep convection and heavy rainfall. Because water vapor scales non-linearly with temperature the vast majority of water vapor (and water vapor variability) is concentrated in the lowest kilometer or two of the atmosphere. This is precisely where current satellite observations from infrared and microwave sounders are most lacking. Thus the known sensitivities of shallow and deep convection, along with radiatively-important shallow clouds, are dwarfed by uncertainty in the spatial and temporal distribution of water vapor. Many of the links between convection and future climate, mediated by circulation and water vapor in the lower troposphere, ought also to be observable in the day-to-day weather, so the opportunity to closely observe the interplay between lower tropospheric water vapor, circulation, and cloudiness has the potential to greatly advance our understanding of the climate system. Observations over land are fairly dense and can be integrated using techniques from weather forecasting, but much of the tropics is oceanic. This is where climatically-relevant low clouds are most prevalent, our existing observations most lacking, and satellite observations hold the most promise.

Nearly 40 scientists, representatives of three distinct communities in equal proportions (theory & modeling, data processing and instrumental / retrieval communities), participated in this workshop. During this workshop, we first assessed the current state-of-the-art in our ability to understand the distribution of lower tropospheric water vapor with emphasis on opportunities for more thoroughly exploiting existing satellite observations from current hyper-spectral microwave and infrared instruments. We then identified ripe near-term opportunities for novel analysis of existing observations to help elucidate the interactions between shallow clouds and their environment. We finally considered opportunities for deployment of surface observing networks and/or intensive field campaigns that might be realized in the five-to-eight year time frame, with the intent of focusing the community around planned deployments or developing plans for new field observations. These three activities were used to highlight the measurement gaps which could be met in the long term by future satellite observing systems. The Workshop was convened by S. Bony-Lena, R. Pincus, B. Stevens, D. Winker, A. Cazenave, and N. Champollion.

Anny Cazenave and Nicolas Champollion

The Scientific Foundation of Space Weather

27 June - 1 July 2016

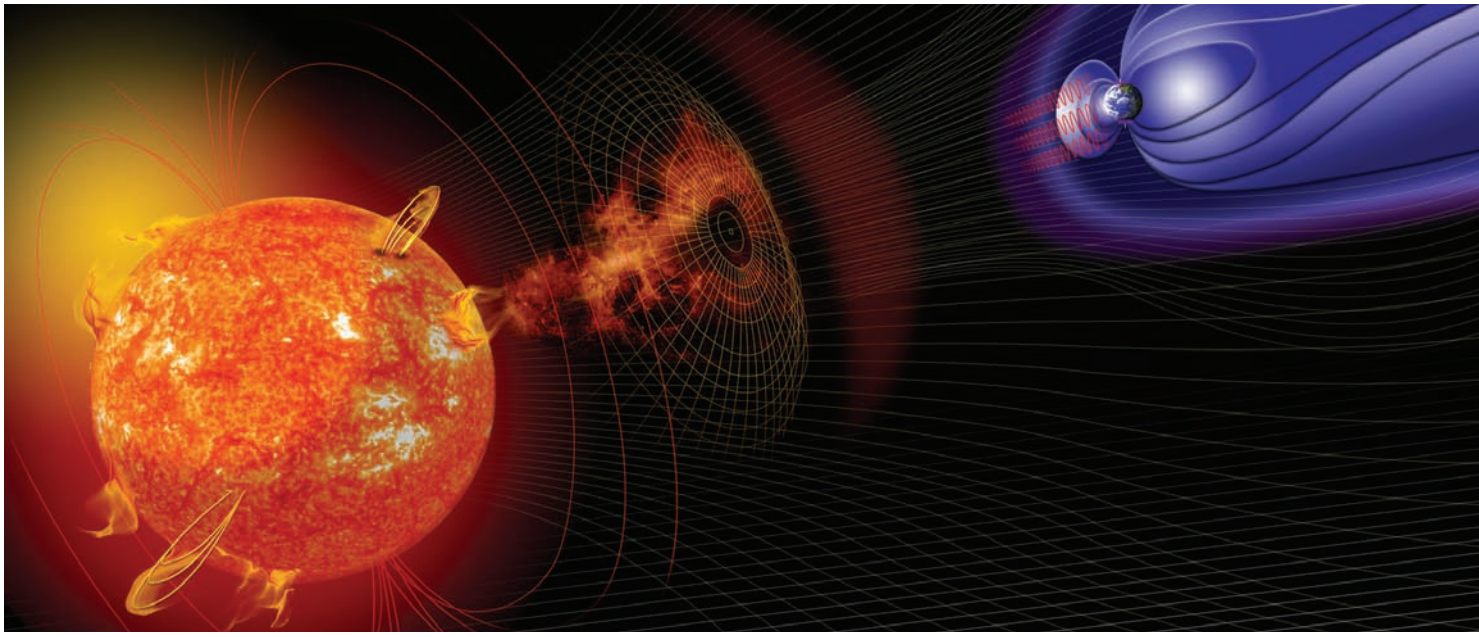


Illustration of Space Weather (Image Credit: NASA)

There has been considerable progress in solar physics, in the physics of space plasmas, and in the physics of the Earth's magnetosphere and ionosphere in recent decades. Solar-terrestrial physics evolved as the discipline that covers studies of solar effects on the Earth's space environment. In more recent years, the concept of space weather has developed as both a scientific discipline and, increasingly, a topic that provides a forum to assess the vulnerabilities of the space infrastructure of 21st century human life on Earth to solar disturbances. Therefore space weather research covers more than solar-terrestrial effects as it also includes the physics behind those phenomena that are identified as hazards in space and on the ground. A key requirement of space weather studies is the understanding of causal chains from the Sun to the terrestrial environment and their quantified predictability.

The science of space weather is therefore effectively a synthesis of solar and near-Earth space phenomena and the causal links from the Sun to the Earth's neighborhood. The objectives of the Workshop were to review the elements of the physical processes and to identify the way they link to each other to form the causal chains from the Sun to the Earth and thus to assess and review the scientific foundations of Space Weather. The topics covered by the Workshop were solar phenomena driving space weather, their predictability, propagation, and geoeffectiveness. This was followed by more general aspects such as space climate (i.e., long-term variations), space weather in a vanishing terrestrial magnetic field, at other planets in the solar system, and at extrasolar planets. Moreover, a special contribution was dedicated to anthropogenic space weather.

The Workshop was convened by D. Baker (Univ. of Colorado, Boulder, USA), A. Balogh (Imperial College, London, UK), T. Gombosi (Univ. of Michigan, Ann Arbor, USA), H. Koskinen (Univ. of Helsinki, Finland), R. von Steiger (ISSI, Bern, Switzerland), and A. Veronig (Univ. of Graz, Austria) and attended by some 44 participants including two young scientists. Because almost half of them were from the USA they jointly applied to their National Science Foundation for travel support, and the fact that this was granted can be taken as a positive confirmation of the status that ISSI Workshops hold internationally. The ISSI approach is in any case unique in the form that of what it provides in terms of a critical review in any particular field. In addition, the Workshop and its resulting ISSI volume will be the final installment of Workshops and volumes that arose from two ISSI Forums, on the Future of Magnetospheric Research and the Solar Activity Cycle.

Rudolf von Steiger

Working Groups

Working Groups are set up by the ISSI Directorate for specific tasks, often also of a technical nature. The results of the Working Groups activities are published as volumes of ISSI Scientific Report Series (SR) or in the scientific literature.

Swarm is ESA's first Earth observation constellation of satellites. The trio of identical satellites are designed to identify and measure precisely the different magnetic signals that make up Earth's magnetic field. The electrical field instrument, positioned at the front of each satellite, measures plasma density, drift and acceleration in high resolution to characterize the electric field around Earth. (Image Credit: ESA/ATG medialab)

Ionospheric Multi-Spacecraft Analysis Tools

The goal of this working group is to provide a comprehensive "tool book" of analysis techniques for ionospheric multi-satellite missions. The immediate need for this book is motivated by the ESA Swarm satellite mission, but the tools that will be described are general and can be used for any future ionospheric multi-satellite mission with comparable instrumentation. The title is intentionally chosen similar to the earlier ISSI book that was motivated by the ESA Cluster multi-satellite mission in the magnetosphere. In the ionosphere, a different plasma environment prevails that is dominated by interactions with neutrals, and the Earth's main magnetic field clearly dominates the total magnetic field. Further, an ionospheric multi-satellite mission has different research goals than a magnetospheric one, namely in addition to the study of the immediate plasma environment and its coupling to other regions also the study of the Earth's main magnetic field and its anomalies caused by core, mantle, or crustal sources. Therefore, different tools are needed for an ionospheric multi-satellite mission as compared to a magnetospheric one, and different parameters are desired to be determined with those tools. Besides currents, electric fields and plasma convection, such parameters include ionospheric conductances, Joule heating, neutral gas densities and neutral winds.

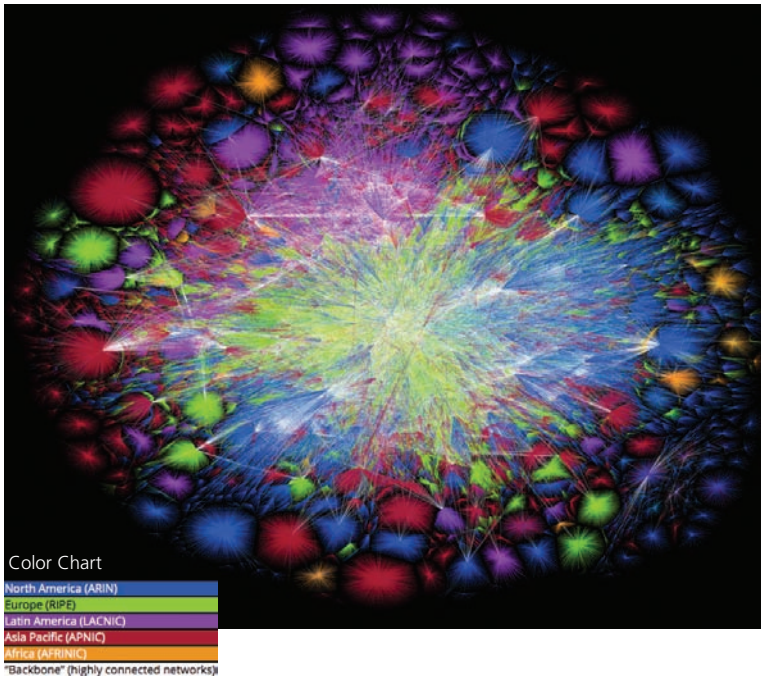
The book that will be the outcome of this working group will thus focus on techniques that are able to derive such local plasma parameters from the immediate multi-satellite measurements, and on techniques that can link these locally derived plasma parameters with observations made by other instruments in adjacent domains (including observations by other satellite missions, such as Cluster, and ground-based observations), in order to determine the coupling between that domain and the ionosphere. In terms of the study of the Earth's main magnetic field, this book will limit itself to tools that utilize the multi-satellite ionospheric observations in order to minimize errors in the main magnetic field modeling. It will thus not include techniques that are designed to determine core, mantle, or crustal magnetic anomalies itself from the main magnetic field model. We believe that this book will become a reference volume for the ESA Swarm mission, as well as for future ionospheric multi-satellite missions.

A first meeting was held 14-16 September 2015. All the members presented their possible contributions. As a result we defined the outline structure of the book and assigned the chapters, which focuses on currents and magnetic modeling. The members are: Tomoko Matsuo (University of Colorado, USA), Joachim Vogt (Jacobs University, Germany), Colin Waters (Newcastle University, Australia), Chris Finlay (DTU, Denmark), Robyn Fiori (Natural Resources Canada, Canada), Patrick Alken (NOAA, USA) and is led by Malcolm Dunlop (Rutherford Appleton Laboratory, UK) and Hermann Lühr (Deutsches GeoForschungs Zentrum, Germany).

Malcolm Dunlop

Earth Observation Open Science and Innovation 2.0

Open Science and Innovation 2.0 refers to the rapid and systematic changes in doing Research, Innovation and Applications driven by the rapid advances in digital technologies combined with a growing demand to do Science for Society (actionable research) and in Society (co-design of knowledge). Nowadays, teams of researchers around the world can easily access a wide range of open data across disciplines and remotely process them on the Cloud, combining them with their own data to generate knowledge, develop information products for societal applications, and tackle complex integrative complex problems that could not be addressed a few years ago. Such rapid exchange of digital data is fostering a new world of data-intensive research, characterized by openness, transparency, and scrutiny and traceability of results, access to large volume of complex data, availability of community open tools, unprecedented level of computing power, and new collaboration among researchers and new actors such as citizen scientists. It also creates new types of applications and new business models.



Visualization of the routing paths of the Internet in 2015. (Image Credit and Copyright: Barrett Lyon / The Opte Project / www.opte.com)

The Earth Observation (EO) community is now facing the challenge of responding to this new paradigm in order to make the most of the large volume of complex and diverse data delivered by the new generation of EO missions, and in particular the Sentinels. In this context, the ISSI Working Group on Earth Open Science and Innovation 2.0 will review the trends and changes in the exploitation of large amount of EO data in a collaborative, cross-disciplinary, and open way, from science to applications, innovation and education. In particular, the Working Group plan to publish a book in the SR series of ISSI that will address the following topics:

- New paradigms in Open Science and Innovation
- New approaches of Citizen Science and Crowdsourcing
- New ICT capabilities on cloud, networks, computing, and big data analytics
- New business opportunities and models in the geo-service industry
- New satellite observing systems, e.g. sentinels, planetary lab, skybox imaging
- New in-situ and remote sensing observing sensors, e.g. drones

The first meeting took place on October 9, 2015. Further meetings are planned.

Pierre-Philippe Mathieu from ESA/ESRIN in Frascati (Italy) is leading this Working Group and it includes the following members: C. Aubrecht (Austrian Inst. of Technology, Austria), H. Bach (Univ. of Munich, Germany), P. Baumann (Jacobs University, Germany), U. Benz (CloudEO AG, Germany), M.A. Brovelli (Politecnico di Milano, Italy), N. Champollion (ISSI, Bern, Switzerland), C. O'Sullivan (Satellite App. Catapult Ltd, Oxfordshire, UK), M. Craglia (Europ. Com. Join Res. Centre, Italy), T. Ferrari (EGI.eu, the Netherlands), M. Haklay (UCL, UK), R. Kapur (Imperative Space, UK), E. Mondon (CloudEO AG, Germany), S. Nativi (Italian National Res. Centre, Italy), S. Oliver (CSIRO, Australia), M. Rast (ESA/ESRIN, and N. Wise (Satellite Applications Catapult Ltd, UK).

Pierre-Philippe Mathieu and Nicolas Champollion

Working Groups

Earth Observation for Atmosphere-Ocean Gas Exchange

Sentinel-3 is arguably the most comprehensive of all the Sentinel missions for Europe's Copernicus programme. Carrying a suite of state-of-the-art instruments, it provides systematic measurements of Earth's oceans, land, ice and atmosphere to monitor and understand large-scale global dynamics and provide critical information for ocean and weather forecasting. (Image Credit: ESA–Pierre Carril)

The ocean and atmosphere are major components of the Earth's surface, with reactions within and between them controlling many of the properties of the Earth's system. The atmosphere-ocean interface represents a vital link between the oceans and the atmosphere by acting as the conduit for the transfer of heat, momentum, aerosols, and gases. This means that understanding the pathways, sources, sinks and budgets of gases like carbon dioxide (CO_2) and its impacts on Earth's climate system is essential for monitoring and projecting future climate scenarios. The atmosphere-ocean exchange of CO_2 has received the most attention amongst marine gases. Each year the oceans are considered to absorb about a third of the anthropogenic CO_2 emissions. There is an increasing awareness that this net flux of CO_2 into the oceans is reducing the pH (or increasing acidification) of the world's surface oceans. The effect of this increasing acidification on marine life, productivity and possible feedbacks to the atmosphere are as yet unclear.

New opportunities that exploit synergy between in situ, modeling and satellite remote sensing and Earth observation for studying, monitoring and underpinning this important area of research are apparent.

The purpose of this working group is to bring together key international researchers working in the field of atmosphere-ocean interaction and satellite Earth observation to
i) identify and formulate new multi-satellite, model and in situ data synergies towards improving our understanding of the pathways, sources, sinks and budgets of greenhouse gases and
ii) identify a roadmap/approach for routine long-term space-asset-based monitoring of the oceanic sink of CO_2 which exploits the Copernicus Sentinels and international networks.

The team members are from 6 countries: Jamie Shutler (UK/Group Leader), Craig Donlon (ESA), Nakajima Masakatsu (JAXA/Japan), Rik Wanninkhof (NOAA/USA), David Woolf (UK), Dorothee Bakker (UK), Andy Watson (UK), Hermann Bange (Germany), Bertrand Chapron (France), Chris Fairall (NOAA/USA), and Phil Nightingale (UK).

The working group held its first meeting during 24-26 November 2015 and the members are now preparing their first publication.

Jamie Shutler

International Teams consist of about 4-15 external scientists, addressing a specific scientific topic in a self-organized fashion, under the responsibility of a Leader in a series of two to three one week meetings over a period of 18 to 24 months. The results of these activities are customarily reported in scientific journals. The selection of Teams results from an annual call for International Teams issued in January and from the subsequent review and prioritization done by the Science Committee.

Listed are Teams that had a meeting at ISSI in the period of the 21st business year. A rationale is given only for the selected teams in 2015; for the others see the previous Annual Reports.

Teams selected in 2012

Kinetic Processes at Airless Bodies

Team leaders: M. Filingim and J. Halekas, University of California at Berkeley, USA
Session: 10-14 August 2015

Teams selected in 2013

Unveiling Multiple AGN Activity in Galaxy Mergers

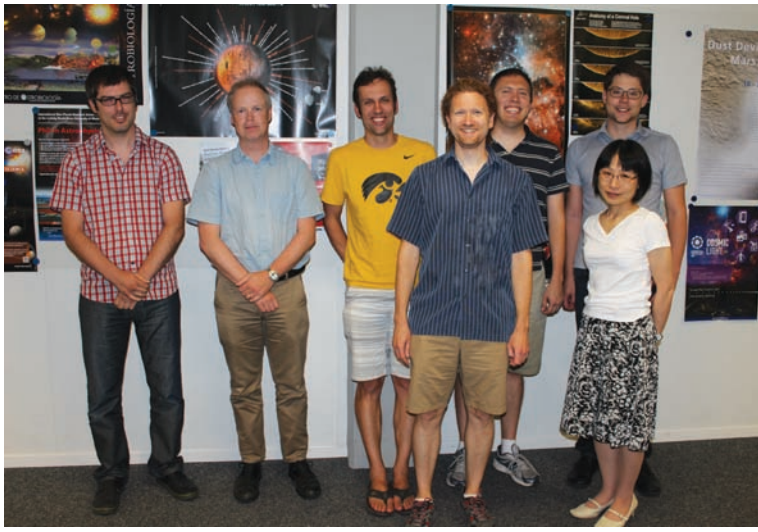
Team leader: Alessandra De Rosa, INAF – Istituto di Astrofisica Spaziale, Rome, Italy
Session: 29 September - 1 October 2015

Multidisciplinary Search for Preservation Windows of Biomolecules in Modern and Ancient Terrestrial Analogs as a Proxy for Ancient Deposits of Mars

Team leader: David C. Fernandez Remolar, Centro de Astrobiología (INTA-CSIC), Madrid, Spain
Session: 14 - 16 December 2015

Energy Transformation in Solar and Stellar Flares

Team leader: Louise Harra, University College London, Surrey, United Kingdom
Session: 19 - 21 January 2016



Picture of the M. Filingim and J. Halekas Team. They worked on Kinetic Processes at Airless Bodies.

The Nature of Coronal Bright Fronts

Team leaders: David Long, University College London, Surrey, United Kingdom, and Shaun Bloomfield, Trinity College Dublin, Ireland
Session: 5-7 April 2016

Sub-arcsecond Observations and Interpretation of the Chromosphere

Team leaders: Lucia Kleint, University of Applied Sciences and Arts Northwestern Switzerland, and Alberto Sainz Dalda, National Center for Atmospheric Research, Boulder, USA
Session: 20-24 July 2015

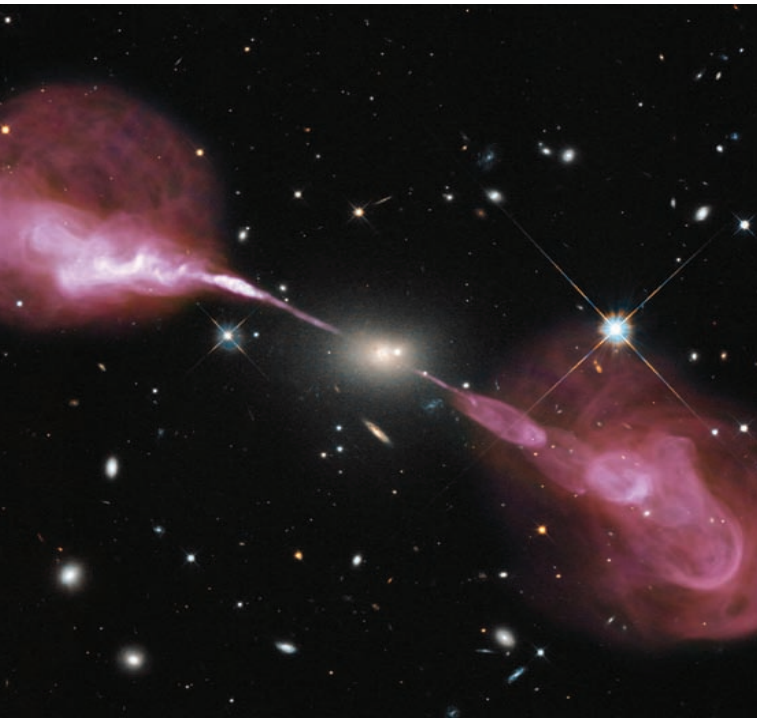
Study Group on the Added-value of Chemical Data Assimilation in the Stratosphere and Upper-troposphere

Team leaders: Richard Ménard, Canadian Meteorological Centre, Dorval, Canada, and Quentin Errera, Institut d'Aéronomie Spatiale de Belgique, Bruxelles, Belgium
Session: 24 - 28 August 2015

Superdiffusive Transport in Space Plasmas and its Influence on Energetic Particle Acceleration and Propagation

Team leaders: Gaetano Zimbardo, Università della Calabria, Arcavacata di Rende, Italy, and Horst Fichtner, Ruhr-Universität Bochum, Germany
Session: 2-6 November 2015

International Teams



A supermassive black hole in action
(Image Credit: NASA, ESA, S. Baum & C. O'Dea (RIT), R. Perley & W. Cotton (NRAO/AUI/NSF), and the Hubble Heritage Team (STScI/AURA))

Teams selected in 2014

SZ Clusters in the Planck Era
Team leaders: Nabila Aghanim and Marian Douspis, IAS, Université Paris Sud, France
Session: 5-8 October 2015

The Extreme Physics of Eddington and Super Eddington Accretion onto Black Holes: A Comprehensive Study of the „Eddington Limit" Across Mass Scales
Team leaders: Diego Altamirano, University of Southampton, United Kingdom, and Omer Blaes, University of California Santa Barbara, USA
Session: 29 February - 4 March 2016

Analysis of Cluster Inner Magnetosphere Campaign Data, in Application the Dynamics of Waves and Wave-particle Interaction within the Outer Radiation Belt
Team leader: Michael Balikhin, University of Sheffield, United Kingdom
Session: 9-13 May 2016

Field-Aligned Currents: Their Morphology, Evolution, Source Regions and Generators
Team leaders: Yulia Bogdanova, Rutherford Appleton Laboratory, STFC, United Kingdom, and Hermann Lühr, Deutsches GeoForschungsZentrum, Potsdam, Germany
Sessions: 9-12 November 2015 and 21-23 March 2016

Solving the Exo-Cartographic Inverse Problem
Team leader: Nicolas Cowan, Amherst College, USA
Session: 6-10 July 2015

Scenarios of Future Solar Activity for Climatemodelling
Team leader: Thierry Dudok de Wit, CNRS-University of Orléans, France
Session: 9-11 September 2015

Magnetosphere-Ionosphere-Thermosphere Coupling: Differences and Similarities between the Two Hemispheres
Team leaders: Matthias Foerster, GFZ German Research Centre for Geosciences, Potsdam, Germany, and Ingrid Cnossen, British Antarctic Survey, Cambridge, United Kingdom
Session: 25-29 April 2016

Analysis of the Circumnuclear Gas and Dust Coma of Comet 67P, the Rosetta Target, on the Basis of 3D and 3D+t Model Fits to Data Collected from Part of the Orbiter Payload
Team leader: Marco Fulle, Osservatorio Astronomico di Trieste, INAF, Italy
Session: 28 September - 2 October 2015

Asteroids and Self Gravitating Bodies as Granular Systems
Team leader: Daniel Hestroffer, Observatoire de Paris, France
Session: 6-8 January 2016

Adding Value to Soil Moisture Information for Climate Studies
Team leader: William Lahoz, Norwegian Institute for Air Research (NILU), Norway
Session: 9-11 November 2015

Constraining the Dynamical Timescale and Internal Processes of the Saturn System from Astrometry
Team leader: Valéry Lainey, Observatoire de Paris, France
Session: 13-15 June 2016

Large-Amplitude Oscillations in Solar Prominences
Team leader: Manuel Luna Bennasar, Instituto de Astrofisica de Canarias (IAC), Spain
Session: 9-13 November 2015

Contemporary Regional and Global Sea Level Rise: Assessment of Satellite and In-situ Observations and Climate Models
Team leader: Benoit Meyssignac, Laboratoire d'Etudes en Géophysique et Océanographie Spatiale (LEGOS), France
Session: 24-27 November 2015

There it Spins: the Hunt for Black Hole Spins
Team leaders: Sara Elisa Motta, European Space Astronomy Centre (ESAC), Madrid, Spain, and Tomaso Belloni, INAF - Osservatorio Astronomico di Brera, Italy
Session: 14-18 September 2015

Facing the Most Pressing Challenges to Our Understanding of the Heliosheath and its Outer Boundaries
Team leaders: Merav Opher, Boston University, USA, and Matthew E. Hill, The Johns Hopkins University, USA
Session: 5-8 October 2015

A Three-Dimensional Ground-to-Space Understanding of Sudden Stratospheric Warmings through a Combination of Numerical Models, Satellite and Ground-Based Observations
Team leader: Nicholas Pedatella, University Corporation for Atmospheric Research, Boulder, USA
Session: 22-26 February 2016

Towards a Global Unified Model of Europa's Exosphere in View of the JUICE Mission
Team leader: Christina Plainaki, IAPS, INAF, Italy
Session: 12-16 October 2015

Bayesian Modeling of the Galactic Magnetic Eld Constrained by Space and Ground-based Radio-millimetre and Ultra-high Energy Cosmic Ray Data
Team leader: Jörg Rachen, Radboud University Nijmegen, The Netherlands
Session: 26-30 October 2015

Coordinated Numerical Modeling of the Global Jovian and Saturnian Systems
Team leaders: Licia C. Ray and Japhet Yates, University College London, United Kingdom
Session: 4-8 January 2016

The Effect of Dense Environments on Gas in Galaxies over 10 Billion Years of Cosmic Time
Team leader: Gregory Rudnick, University of Kansas, USA
Session: 14-18 September 2015

Magnetic Waves in Solar Flares: Beyond the "Standard" Flare Model
Team leaders: Alexander Russell, University of Dundee, United Kingdom, and Lyndsay Fletcher, University of Glasgow, United Kingdom
Session: 9-13 May 2016

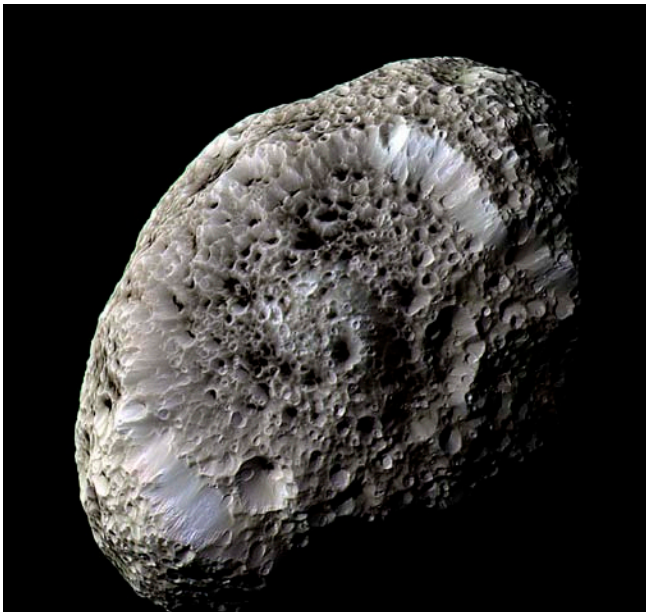
Solar Heliospheric Lyman Alpha Profile Effects (SHAPE)
Team leader: Martin Snow, University of Colorado at Boulder, USA
Session: 25-28 January 2016

Understanding Energetic Particle Injections and their Effect on Earth's Outer Radiation Belt Electrons using Multipoint Observations
Team leaders: Drew L. Turner, University of California, Los Angeles, USA, and Geoffrey Reeves, Los Alamos National Laboratory, USA
Session: 21-25 September 2015

Magnetic Helicity Estimations in Models and Observations of the Solar Magnetic Field
Team leaders: Gherardo Valori, INAF - Osservatorio Astronomico di Roma, Italy, and Etienne Pariat, Observatoire de Paris-Meudon, France
Session: 12-16 October 2015

Improving the Analysis of Solar and Stellar Observations
Team leader: Harry P. Warren, Naval Research Laboratory, Washington, USA
Session: 13-15 April 2016

International Teams



Saturn's sponge-like moon Hyperion (Image Credit: NASA/JPL/Space Science Institute)

Teams selected in 2015

Rotational Phenomena in the Saturnian Magnetosphere

Team leaders: David J. Andrews, Swedish Institute of Space Physics, Uppsala, Sweden, and Georg Fischer, Austrian Academy of Sciences, Graz, Austria
Session: 26-30 October 2015
Scientific Rationale: Following the past decade of study of extended rotational phenomena in Saturn's magnetosphere, it has become evident that the collaborative atmosphere is giving renewed impetus to this research. The team includes active researchers in analysis of magnetometer, radio, and particle data sets, as well as the capability for the development of theoretical models. The focus is on the synthesis and joint analysis of existing data sets, with a view to provide the best possible estimate of the periodicity, time-variability, phase relationships, response to solar wind variations, and global structure of these modulations. A complete theory of the origin of these periodic phenomena in an otherwise axi-symmetric magnetosphere is a significant development within space physics, and is likely required for the refinement of models of Saturn's interior magnetic field. Furthermore, this work has direct applications to the study of other rotating magnetospheres both inside and outside our solar system, where similar processes are likely occurring.

Analysis of Persistent Regional Air Pollution in Asia *(ISSI-ISSI BJ Team)*

Team leaders: Guy Brasseur and Idir Bouarar, Max Planck Institute for Meteorology, Hamburg, Germany
Session: 17-20 May 2016
Scientific Rationale: The team consists of air pollution specialists to address the unresolved problem of the formation of persistent and health-threatening aerosol layers during wintertime in large areas of Asia. The objective is to bring together a group of experts representing different disciplines to address the problem of the formation of large haze episodes in Asia from different perspectives (space observations, surface monitoring, profiling, laboratory approaches, data analysis, modeling and impacts). The two meetings, one in Bern and one in Beijing lead to the production of a book and to papers that present the state-of- the-art on this issue. Of highest importance is the participation of Asian experts who have collected large datasets and are ready to contribute.

Researching the Diversity of Planetary Systems

Team leader: Juan Cabrera, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Berlin, Germany
Session: 30 May - 3 June 2016
Scientific Rationale: One of the main goals of exoplanet research is the understanding of the processes governing planetary formation and, in particular, the comprehension of the position of the Solar System among the planetary systems in the Galaxy. The scientists investigate the properties of stellar activity analyzing photometric data from space-borne transit surveys. Furthermore, the team investigates methods to mitigate its impact in planetary detection, increasing the performance of transit detection tools. They explore synergies between different observing techniques, optimizing the yield of exoplanet surveys by a careful design of their observing strategy and their validation process. Moreover, the conclusions are timely for projects like NGTS, CHEOPS, TESS, and the planet-finder European mission PLATO 2.0.

Towards New Models of Solar Spectral Irradiance based on 3D MHD Simulations

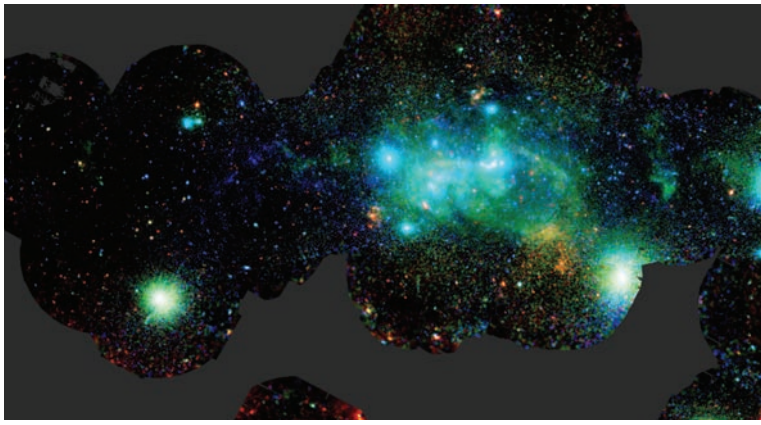
Team leader: Serena Criscuoli, National Solar Observatory, USA
Session: 14-18 March 2016
Scientific Rationale: The formation of this team is a unique opportunity to bring two communities together and make them aware of the difficulties inherent in irradiance measurements and reconstruction on the one hand, and in multi-dimensional modeling of the solar atmosphere on the other, and to foster development of irradiance models based on 3D MHD simulations. By focusing on specific issues, the team answers the question of whether, and how, 3D MHD simulations of the solar atmosphere can be employed to improve our understanding of solar spectral irradiance variations, and reproduce them more faithfully for the purpose of improving the knowledge of the Sun-Earth atmosphere interaction.

Plasma - Surface Interactions with Airless Bodies in Space and the Laboratory

Team leaders: Jan Deca and Wang Xu, University of Colorado, Boulder, USA
Session: 1-5 February 2016
Scientific Rationale: The goal is to explore key challenges in plasma-surface interactions at airless planetary bodies by exploiting the synergies between in-situ observations, computer simulations, and laboratory experiments to identify and understand the fundamental physical processes determining the global and local near-surface plasma environment.

Nuclear Reactions in Superdense Matter – From the Laboratory to the Stars

Team leader: Duncan Galloway, Monash University, Victoria, Australia
Session: 7-11 December 2015
Scientific Rationale: Type 1 X-ray bursts are thermonuclear flashes observed from accreting neutron stars in binary star systems. Due to the strong gravity and high temperature, these bursts probe nuclear physics and reactions not encountered elsewhere in nature, and also depend on the properties of the underlying neutron star – and hence the properties of matter at these extreme conditions. The ultimate goal is to reconcile, in detail, experimental, observational and numerical investigations on these bursts



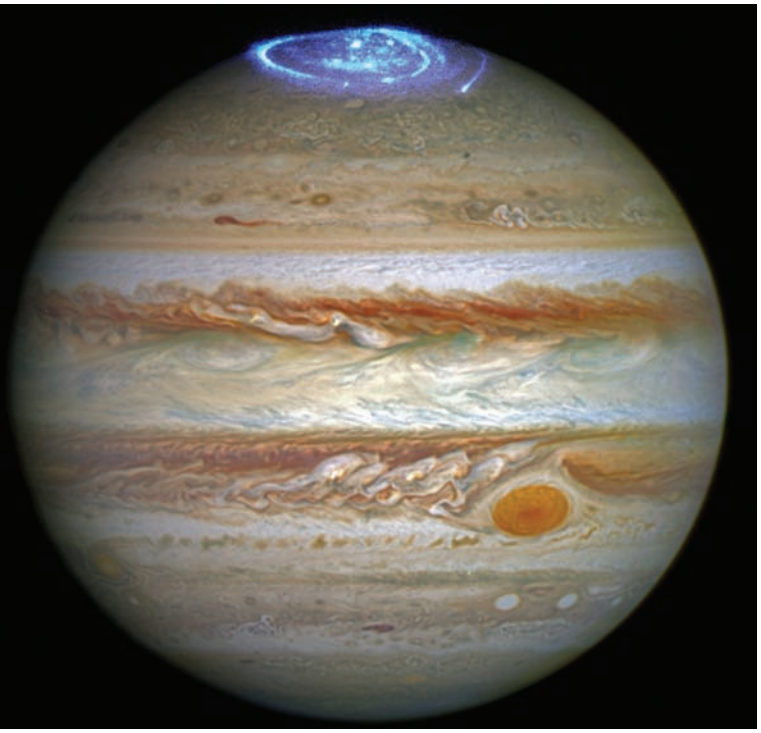
X-ray view of the Galactic Centre (Image Credit: ESA/ XMM-Newton/G. Ponti et al. 2015)

and the nuclear reactions that power them. To achieve this goal, this team was assembled to identify the key nuclear reactions which influence the burst lightcurve; take advantage of new rare-isotope accelerator- based experiments and satellite observations to provide stringent tests of numerical models; identify specific cases of ignition and burning from observation-model comparisons; and provide qualitatively new constraints on the properties of neutron stars and nuclear matter.

EuroMoon: Lunar Surface Composition and Processes

Team leader: Manuel Grande, Aberystwyth University, United Kingdom
Session: 29 February - 4 March 2016
Scientific Rationale: Recent years have seen new observations from an international fleet of lunar probes (including, Chang'e 1, 2, and 3, Chandrayaan-1, Kaguya (SELENE), LRO, LADEE, and SMART-1). Many excellent instruments were led and funded from Europe. Large amounts of historic data exist from the Moon, and the main aim of the EuroMoon consortium is to scientifically exploit this data. This team is constituted of representatives of the core EuroMoon team, with additional leading international lunar scientists. The aim is to investigate the lunar surface composition and processes that take place in the uppermost layers of the lunar regolith, including the water cycle on the Moon. The detailed understanding of the physics that processes the material at the surface, altering and recycling it, has been greatly facilitated by recent observations.

International Teams



Auroras on Jupiter (Image Credit: ESA/NASA)

Cosmology with Size and Flux Magnification

Team leaders: Alan Heavens, Imperial College London, London, United Kingdom, and Hendrik Hildebrandt, Bonn Universität, Germany
Session: 22-26 February 2016
Scientific Rationale: The team of scientists is studying weak lensing magnification, a promising method using the changes in size and brightness of galaxy images caused by the lensing effect. This information is collected at the same time as the galaxy shapes, with little extra effort, and can be used to analyze the matter distribution in a similar way, giving us an independent probe of dark energy and modified gravity. It adds signal to what the team members can measure from weak lensing, but more importantly, it acts as a cross-check. However, as the development of size and flux magnification lags far behind that of cosmic shear, there is a lot of work that needs to be done, to show that it can provide accurate and precise results in the small-signal regime on a cosmic scale. The team works on the theoretical as well as the observational side of this field to make significant progress in the exploitation of magnification in forthcoming large galaxy surveys.

Ring Current Modeling: Uncommon Assumptions and Common Misconceptions

Team leaders: Raluca Ilie, University of Michigan, Ann Arbor, USA, and Natalia Ganushkina, Finnish Meteorological Institute, Helsinki, Finland
Session: 7-11 March 2016
Scientific Rationale: Despite many years of ring current modeling, which has led to qualitative and quantitative progress in the understanding of such complex processes, predicting the creation and demise of the ring current still requires several sets of assumptions, ranging from boundary conditions, composition knowledge to physical limitations of equations sets. The team contains experts on this topic and will examine these common/known and less common/known facts of ring current modeling. Questions to answer are: 1. What are the common/uncommon assumptions we make and should they be revisited? 2. What do we know so far from kinetic, MHD, particle tracing, empirical modeling? 3. What model dependent results are teaching us? 4. What data sets do we need in order to improve the theoretical representation of the inner magnetosphere currents?

Structure and Dynamics of Jupiter's Magnetosphere and Boundary Regions

Team leaders: Caitriona Jackman, University of Southampton, United Kingdom, and Christopher Paranicas, The Johns Hopkins University, USA
Session: 25-29 April 2016
Scientific Rationale: Jupiter's magnetosphere is the biggest coherent structure in our solar system, and has been visited by eight spacecraft to date. Jupiter is a planet of superlatives, with the strongest magnetic field and the fastest rotation of any planet in the solar system. However, it also holds many mysteries, in particular the extent to which the solar wind can influence its magnetosphere. This team will capitalize on the availability of newly reprocessed data from the Galileo mission, shedding light on the nature of plasma flows within the system. The team members also focus on the interaction at the magnetospheric boundaries, working to understand the depth to which any boundary interactions can penetrate. In addition to data analysis, they explore recent models that together include fundamentally different explanations of some jovian dynamics. The project is the opportunity to gather lead proponents of such models to have an open-minded discussion

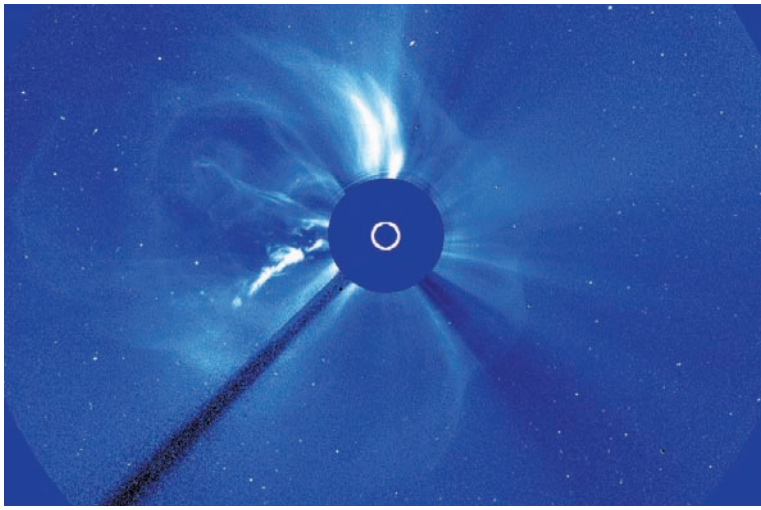
about which aspects of the various models are complementary, and which are mutually exclusive. The team will carry out their work through the period of Juno's approach and initial orbits of Jupiter.

The Connection Between Coronal Shock Wave Dynamics and Early SEP Production

Team leaders: Kamen A. Kozarev, Smithsonian Astrophysical Observatory, Cambridge, USA, and Nariaki V. Nitta, Lockheed Martin Solar and Astrophysics Laboratory, USA
Sessions: 2-6 November 2015 and 4-8 April 2016
Scientific Rationale: A slew of recent remote observations have shown that sufficiently fast coronal mass ejections (CMEs) can drive shock waves very low in the solar atmosphere. To date the connection between the global coronal field configuration, observed shock wave dynamics, and their efficiency at producing SEPs remains unresolved. This team has been formed to unravel this connection. The members identify a number of events to analyze, using both remote and in situ observations. Comparisons are made with simulated data and current theory models, in order to explore the parameter space of coronal shock waves, their interaction with the magnetic fields in the low and middle corona and their association with SEP events.

EO Validation Across Scales

Team leaders: Alexander Loew, University of Munich, Germany, and Christian Klepp, University of Hamburg, Germany
Session: 18-21 January 2016
Scientific Rationale: Solving the point2area problem is a prerequisite and key to meaningful validation and evaluation of remotely sensed climate data records across the disciplines of geoscience. The complexity of the point2area problem grows significantly with increasing spatio-temporal variability and intermittency of the Essential Climate Variable (ECV) investigated. To date, there is no unique way of treating the point2area problem. Hence, each science community employs different distinct approaches to tackle this issue. The major objectives are therefore a) to foster strong exchange across various scientific disciplines, b) to review existing methods, c) to publish a white paper, d) to streamline commonalities, e) to develop joint methods and tools and f) to provide educational outreach and capacity building. In the long-term the nucleus formation of a point2area team is envisaged at the international level. Future satellite missions and climatological data records are expected to benefit from the joint community effort in terms of validation, evaluation, calibration and uncertainty characteristics of retrievals and the scale dependency.

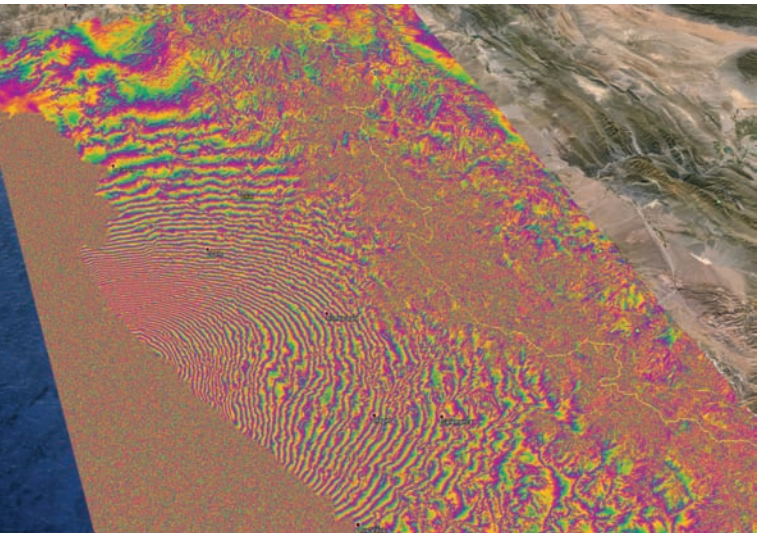


Solar flare seen by SOHO on August 31, 2012 (Image Credit: ESA/NASA)

Accelerated Ions – The Elusive Component of Solar Flares

Team leader: Alexander MacKinnon, University of Glasgow, United Kingdom
Session: 1-5 February 2016
Scientific Rationale: Solar flares have paradigmatic status for studies of explosive plasma processes in astrophysics. Basic questions remain at best incompletely answered: why do superficially similar flares differ so greatly in ion acceleration? How important are ions in the overall flare energy budget? To address these questions and work towards a greater understanding of flare ion acceleration, we assembled a team including expertise in solar, space, plasma, nuclear and atomic physics. The team members concentrate on a couple of key areas: non-γ-ray channels for learning about flare ions, particularly in the energy range below 1 MeV/nucleon that determines the total ion energy content; multi-wavelength context studies that will define key determinants of flare ion acceleration, and thus its relationship to the primary energy release process. These studies will also address the link between ions at the flare site and ions in the interplanetary medi-

International Teams



Chile earthquake on the radar (Image Credit: contains modified Copernicus Sentinel data (2015)/ESA SEOM INSARAP study PPO.labs/NORUT)

um. The team draws on observations from RHESSI, Fermi, SDO and other recent experiments, aiming to exploit existing observations fully, to identify any promising new observational techniques and to determine what new instrumental advances will be needed for real progress.

Understanding Solid Earth/Ocean-Ionosphere Coupling: Improving Models and Observational Capabilities for Monitoring Tsunamis from Space

Team leaders: Jonathan Makela, University of Illinois, USA and Lucie M. Rolland, Université Côte d'Azur, Valbonne, France
Session: 22-25 February 2016
Scientific Rationale: Over the past decade, the idea of quantitatively relating observations made of the earth's ionosphere to tsunami and large seismic events has gone from a far-fetched dream to one having significant potential for both understanding the vertical coupling of the earth's surface with the atmosphere and as a monitoring tool for these devastating events. This progress is rooted in the increased capabilities provided by a variety of observational modalities, most notably ground- and space-borne global navigation satellite system (GNSS) receivers and airglow imaging systems, which provided definitive evidence of the efficient upward coupling for the 2011 Tohoku and 2012 Haida Gwaii events. To study the details of the generated gravity waves and their coupling into the ionosphere, several models have been developed. This team work bring together the authors of these different models to discuss the assumptions, strengths, and weaknesses of each model.

A Comprehensive View of Stellar Winds in Massive X-ray Binaries

Team leader: Silvia Martínez-Núñez, University of Alicante , Spain
Session: 15-19 February 2016
Scientific Rationale: This team brings together specialists in winds from massive stars and also observers of High-Mass X-ray Binary systems in order to review the state-of-the-art in observations and modelling and to develop a unified view on the physics of the stellar winds in these systems. While the basic picture has been established for decades, many details are still debated.

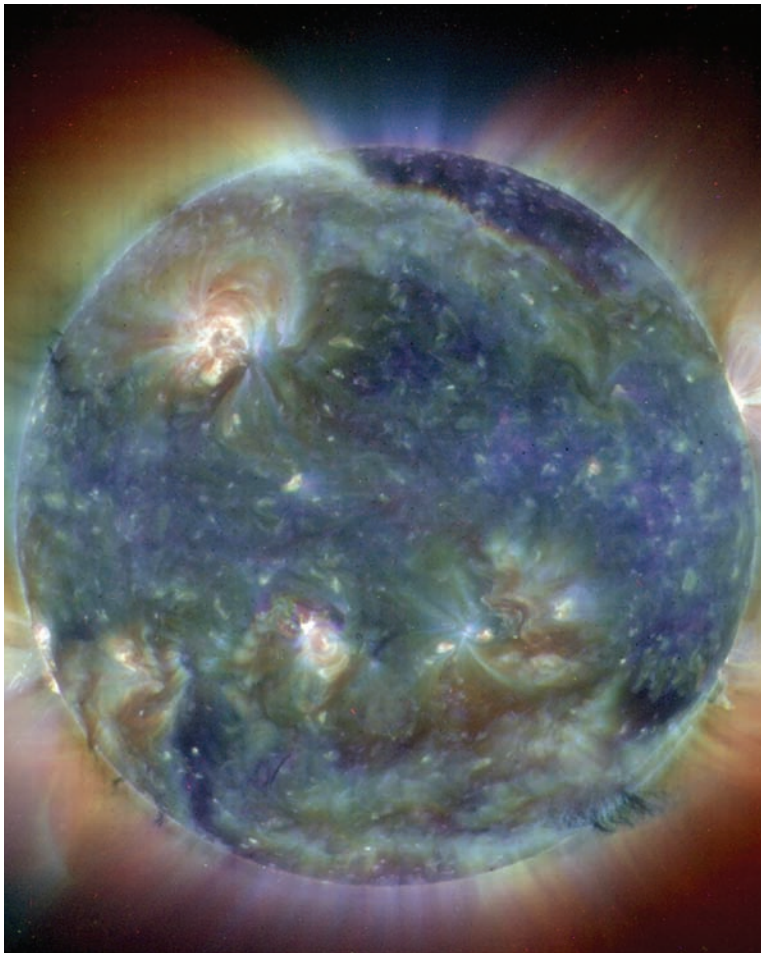
Particle Acceleration in Solar Flares and Terrestrial Substorms

Team leader: Mitsuo Oka, University of California, Berkeley, USA
Session: 15-19 February 2016
Scientific Rationale: High-energy non-thermal particles are produced during explosive energy-release phenomena in space and solar environments. The team combines observations, simulations and theories to systematically study particle acceleration of flares and substorms with particular emphasis on the energetics. Specifically, the team focussed on the following key unanswered questions: 1. How energies are partitioned between thermal and non-thermal particles in the key regions of solar flares and the Earth's magnetosphere? 2. How energies are transported (in the forms of Poynting, enthalpy and bulk kinetic energy fluxes) to the obstructions (i.e., flaring loops and the chromosphere, the dipole magnetosphere and the ionosphere)?

Decoding the Pre-Eruptive Magnetic Configurations of Coronal Mass Ejections

Team leaders: Spiros Patsourakos, University of Ioannina, Greece, and Angelos Vourlidas, The Johns Hopkins University, USA
Session: 4-8 April 2016
Scientific Rationale: Coronal Mass Ejections (CMEs) are transient expulsions of large amounts of coro-

nal plasma and magnetic flux into the Heliosphere. They represent a key energy release process in the solar corona, and a major driver of space weather. A largely unresolved and fiercely debated problem of CME physics concerns the nature of their pre-eruptive magnetic configurations. The aim of the team is as follows: (1) Combine MHD theory and modeling to generate a pre-eruptive structure diagnostics matrix. (2) Juxtapose the pre-eruptive structure diagnostics matrix with observations to determine the dominant pre-eruptive configuration. (3) Determine the dominant physical mechanism(s) behind the formation of the observed pre-eruptive configurations. (4) Compile a list of recommendations for observational set-ups of future solar instrumentation.



Ultraviolet image shows the Sun's intricate atmosphere (Image Credit: SOHO (ESA & NASA))

Polar Stratospheric Cloud initiative (PSCi) Workshops

Team leader: Michael Pitts, NASA Langley Research Center, Hampton, USA
Session: 28 September - 2 October 2015
Scientific Rationale: After nearly three decades of research, the role of polar stratospheric clouds (PSCs) in stratospheric ozone depletion is generally well established. However, important questions remain unanswered that limit the understanding of PSC processes and how to accurately represent them in global models, calling into question the prognostic capabilities for future ozone loss in a changing climate. These activities will ultimately lead to improved representation of PSC processes in global climate models and to the development of a database against which existing and future models may be tested. To achieve these goals, this team bring together key scientists representing satellite, ground-based, balloon, and aircraft measurements, as well as theoreticians and modelers.

Jets Downstream of Collisionless Shocks

Team leaders: Ferdinand Plaschke, Austrian Academy of Sciences, Graz, Austria, and Heli Hietala, Imperial College London, United Kingdom
Session: 15-19 February 2016
Scientific Rationale: Different groups studying jets/plasmoids (including source regions/mechanisms and jet impacts) have been largely disconnected from each other. Consequently, the findings in this field currently resemble pieces of a puzzle rather than a full picture. The aim of this team is to bring existing and new pieces together in order to construct that picture: by compiling a comprehensive review article; by initiating teamwork between researchers familiar with data analysis and simulations, to reconcile findings from both approaches; and by launching inter-disciplinary collaborations to significantly advance our understanding of the nature of jets/plasmoids and bursty bulk flows. The team's expertise covers all areas relevant to the research. The team is in a unique position to overcome present shortcomings of individual approaches to the jet/plasmoid phenomenon.

International Teams

This galaxy, known as NGC 2337, resides 25 million light-years away in the constellation of Lynx. NGC 2337 is an irregular galaxy, meaning that it — along with a quarter of all galaxies in the Universe — lacks a distinct, regular appearance. (Image Credit: ESA/Hubble & NASA)

Galactic Cosmic Ray Origin and Composition

Team leader: Nikos Prantzos, Institut d'Astrophysique de Paris, France

Session: 11-15 April 2016

Scientific Rationale: Despite a century of intense theoretical and observational investigation, the origin of Galactic Cosmic Rays (GCRs) remains poorly understood at present. Supernova remnants remain the most popular site for the acceleration of GCR particles (mostly protons), but the various candidate physical processes have not been sufficiently elucidated yet. There is no model of GCR acceleration accounting in a self-consistent way for the detailed GCR source composition. This team project undertakes a thorough investigation of the problem of GCR acceleration and composition in a realistic astrophysical setting, considering each one of the key factors: e.g., properties of the supernova progenitor stars, properties of the circumstellar medium of the supernovae, propagation of the supernova shock wave in the surrounding medium, particle acceleration in that environment, resulting observational signatures, comparison with existing observations, analysis of implications, suggestions for forthcoming experiments.

The Formation and Evolution of the Galactic Halo – Setting the Scene for the Large Modern Surveys

Team leader: Donatella Romano, INAF-Osservatorio Astronomico di Bologna, Italy

Session: 1-5 February 2016

Scientific Rationale: The formation and evolution of galaxies is one of the great outstanding problems of astrophysics. In the currently favored ΛCDM galaxy formation paradigm smaller structures collapse first, while larger galaxies form later, with accretion events playing an important role, in particular for the build-up of stellar halos. The search for the surviving relics of such assembly processes is still open. The team is composed of recognized experts with complementary expertise: (i) stellar spectroscopy and derivation of chemical abundances; (ii) NLTE abundance calculations; (iii) dynamics of stellar systems; (iv) numerical simulations, chemo-dynamical and semi-analytical models; (v) surveys and data mining. All these skills are necessary to achieve the project objectives: (i) to investigate and compare the level and significance of chemical inhomogeneities in low-metallicity systems (from the smallest UFDs to the Galactic inner and outer halo fields, through the classical dwarf spheroidals and Galactic GCs); (ii) to unravel the origin of low-metallicity stars with peculiar chemical composition (C-rich stars, low-[α/Fe] stars, second-generation stars in GCs...) found in the Local Group; (iii) to assess the role of galactic outflows in shaping the chemical properties of galaxies; (iv) to quantify and characterize the fractions of 'accreted' versus 'formed in situ' stars in the solar vicinity.

Radiation Interactions at Planetary Bodies

Team leader: Nathan Schwadron, University of New Hampshire, USA

Session: 7-11 March 2016

Scientific Rationale: Since the launch of the Lunar Reconnaissance Orbiter (LRO) in 2009, the Cosmic Ray Telescope for the Effects of Radiation (CRaTER) has directly measured the Lunar radiation environment and mapped albedo protons (~100 MeV) coming from the Moon. Particle radiation has widespread effects on the lunar regolith ranging from chemical alteration of lunar volatiles to the formation of subsurface electric fields with the potential to cause dielectric breakdown that could modify the regolith in permanently shaded craters. LRO/CRaTER's direct

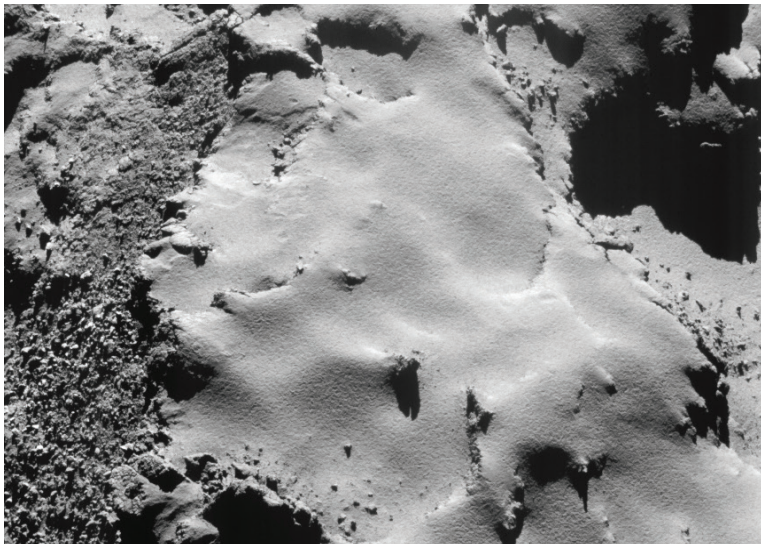
measurements are transforming our understanding of the lunar radiation environment and its effects on the moon. Recent measurements of galactic cosmic radiation and solar energetic particle radiation at other planetary objects (e.g., the moons of Mars) raise new fundamental questions about how radiation interacts at planetary bodies and what its long term impacts are.

Physical Properties of Cometary Nuclei Assessed from the Development of 67P CG's Activity

Team leader: Yuri Skorov, Technical University of Braunschweig, Germany
Session: 21-23 March 2016
Scientific Rationale: The thermophysical properties of the surface layer of comets remain surprisingly difficult to assess. The near-absence of pure water ice on their surfaces implies either an intimate mixing of volatiles with a dark non-volatile constituent or a surface layer covering a more volatile-rich interior. This project is designed to place constraints on the thermal, chemical, and structural properties of the surface layer and to establish mechanisms for mass (both volatile and non-volatile) loss as a consequence of these properties. The key probably lies in the microphysics of the surface layers and hence we seek to establish and constrain models of these layers using multiple datasets from the Rosetta spacecraft and the Philae lander.

New Diagnostics of Particle Acceleration in Solar Coronal Nanoflares from Chromospheric Observations and Modeling

Team leader: Paola Testa, Harvard-Smithsonian Center for Astrophysics, Cambridge, USA
Session: 26-29 January 2016
Scientific Rationale: The team determines the statistical properties of the observed spatial and temporal distribution of small-scale brightenings by analyzing chromospheric and TR observations of loop footpoint emission (IRIS), combined with coronal observations (Hinode/XRT and EIS, SDO/AIA). At the same time the team members further develop the numerical models, focusing on including more realistic background atmosphere(s), as these play a critical role in determining the response of the plasma to impulsive heating events and the non-thermal particle properties. By comparing directly, in a quantitative fashion, the observations (in particular focusing on chromospheric and transition region emission) with the predictions of models of impulsively heated loops they will be able to investigate the prevalence and importance of non-thermal particles in non-flaring coronal plasma, and constrain the parameters of the non-thermal electron distribution.

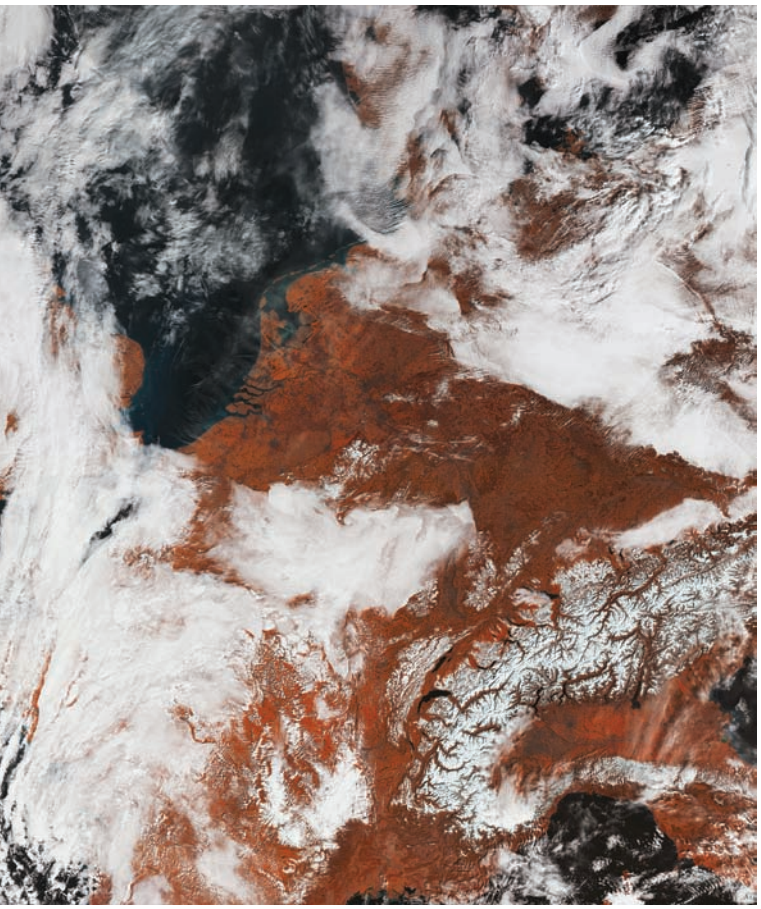


Single frame enhanced NavCam image taken on 18 July 2016, when Rosetta was 9.5 km from the center of the nucleus of Comet 67P/Churyumov-Gerasimenko. (Image Credit: ESA/Rosetta/NavCam – CC BY-SA IGO 3.0)

Astrobiology in the New Age *(ISSI-ISSI BJ Team)*

Team leader: Feng Tian, Peking University, China
Session: 11-13 April 2016
Scientific Rationale: Astrobiology, the quest for life in the universe, is "scientifically" driving most NASA and ESA exploratory missions in the Solar System and beyond. China is developing a solid plan of exploration of the Solar System and construction of new generation scientific satellites. A strong astrobiology community in China will be able to suggest substantial science cases to make its space exploration efforts beneficial. Here we propose to organize an ISSI-ISSI-BJ astrobiology team in order to address some strategic questions important to the development of China's astrobiology community. The team is highly interdisciplinary with a broad expertise to study Astrobiology. The results of this team work will be important for identifying priorities in astrobiology in China and will foster the growth of this discipline in China, which could in turn contribute to relevant researches internationally.

International Teams



Part of Europe from the Alps in the lower right to the North Sea in the upper left was captured by Sentinel-3A's Ocean and Land Color Instrument on 10 March 2016. The image utilizes only three of the instrument's 21 spectral channels – giving a false color impression with land in red. (Image Credit contains modified Copernicus Sentinel data [2016], processed by ESA)

How Does the Solar Wind Influence the Giant Planet Magnetospheres?

Team leaders: Marissa Vogt, Boston University, USA, and Adam Masters, Imperial College London, United Kingdom

Session: 25-29 April 2016

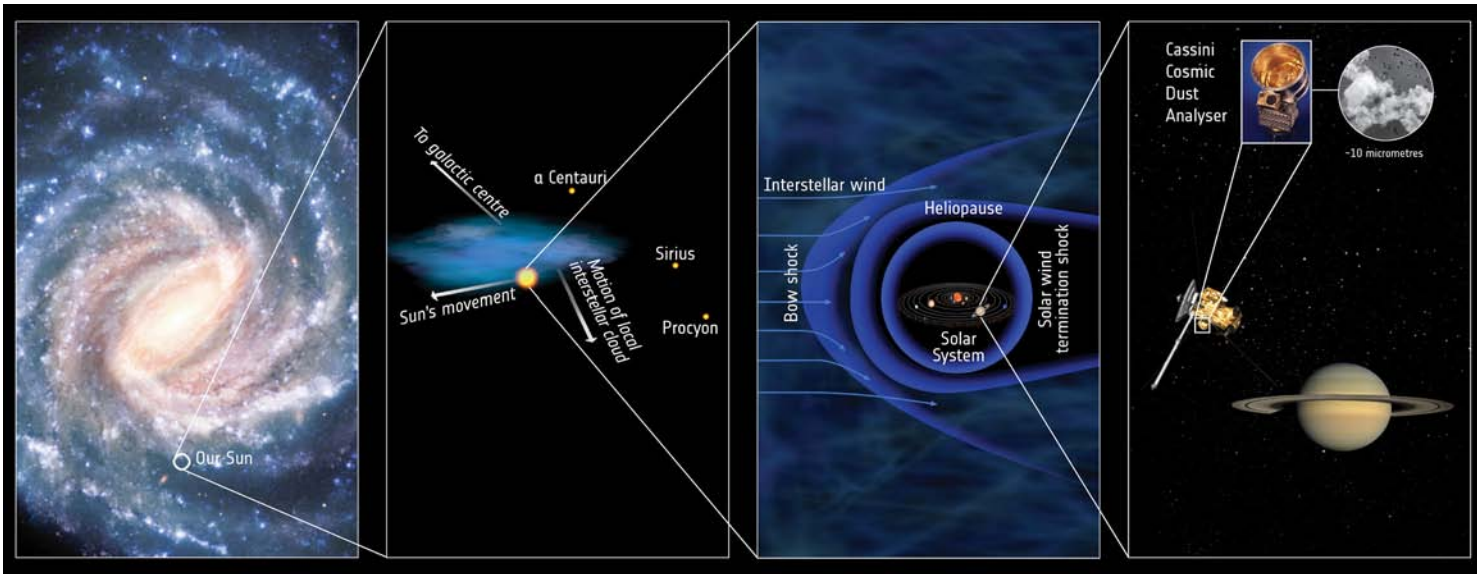
Scientific Rationale: The team determines the nature of the solar wind influence on the outer planet magnetospheres. Now, thanks to the existence of many relevant data sets and foundations laid by the magnetospheric science community, they are in a position to establish more definitively how the solar wind influences these giant magnetospheric systems. The team is poised to accomplish this goal due to the inclusion of experts on both the outer planet magnetospheres and the more comprehensively studied magnetosphere of the Earth, combining experience in data analysis, theory, and modeling. They reveal the nature of magnetopause processes, carry out a detailed examination of the magnetospheric response to varying solar wind conditions, and assess magnetotail reconnection signatures in the outer planet magnetospheres. To quantify the relative importance of the dynamic solar wind for Jovian and Saturnian magnetospheric dynamics, the team members constrain the potential differences applied to each system by each mode of external solar wind driving, and compare this to the well-established potentials associated with internal driving.

Multi-Scale Variations in Auroral Electron Precipitation

Team leader: Daniel Whiter, University of Southampton, United Kingdom

Session: 4-8 January 2016

Scientific Rationale: The goal is to study auroral precipitation using a unique setup of satellite-based in-situ measurements and ground-based observations, with the application of state-of-the-art generalized tomography-like methods. The team aims to build a full three-dimensional picture of the energy spectra of precipitating particles. The particle energy distribution and its variations control the auroral excitations, and have an important impact on various ionospheric processes as well as affecting the composition and chemistry of the high latitude upper-atmosphere. Variations in the electron precipitation energies are ultimately driven by solar wind and magnetospheric activity and therefore are a convenient way to gain new information on several processes taking place in the near-Earth plasma environment.



The Cosmic Dust Analyzer on the Cassini spacecraft has detected the faint but distinct signature of dust coming from outside our Solar System, from the local interstellar cloud, an almost empty bubble of gas and dust we are traveling through with a distinct direction and speed. The graphic summarizes the location of Saturn, and the Solar System, with respect to the local interstellar cloud, and our place in the Milky Way galaxy. In the final image an artist impression of the Cassini spacecraft is shown (not to scale) with Saturn. (Image Credit: ESA; dust grain inset: NASA/JPL; Saturn image: NASA/JPL/Space Science Institute)

Comparison and Validation of Global Non-Potential Magnetic Models of the Solar Corona

Team leader: Anthony Yeates, Durham University, United Kingdom

Session: 24-28 July 2015

Scientific Rationale: The team is composed of ten researchers with expertise on the structure and evolution of the global magnetic field in the Sun's corona. This is a timely problem: modern technological society is becoming increasingly vulnerable to severe space weather events, yet operational forecasts are based on traditional potential-field extrapolations of the coronal magnetic field. Potential-field models cannot account for the distribution and evolution of free magnetic energy in the low corona, which is responsible for driving violent eruptions and variations in the interplanetary magnetic field. At the same time, modern satellite observations are revealing indirect evidence of this non-potential structure. The focus is to compare different non-potential modeling approaches that are currently under development. The expected outcome of the research is a clearer understanding of non-potential magnetic fields in the low solar corona. It will also result in a better understanding of the strengths/weaknesses of the models and lead to improved models for the global magnetic field and space weather prediction.

Solar UV Bursts – A New Insight to Magnetic Reconnection

Team leader: Peter Young, George Mason University, Fairfax, USA

Session: 25-29 January 2016

Scientific Rationale: The Sun's activity is widely believed to be driven through small-scale magnetic reconnection events that heat plasma and drive plasma flows. The recently-launched Interface Region Imaging Spectrograph (IRIS) spacecraft gives high spatial resolution access to the Sun's chromosphere and transition region and has revealed a particular class of highly-energetic events termed ultraviolet bursts (UVBs) with a several-order of magnitude increase in radiation and 100s of km/s plasma flows, occurring on spatial scales of ~500 km. The new observations bring the team together to work on how the events are driven by the magnetic field and how the released energy is distributed through the solar atmosphere.

International Teams approved in 2016

The Teams below have been selected for implementation from the proposals received in response to the 2016 Call for International Teams:

From Qualitative to Quantitative: Exploring the Early Solar System by Connecting Comet Composition and Protoplanetary Disk Models
Team leader: Boncho Bonev (US)

Quasi-periodic Pulsations in Stellar Flares: A Tool for Studying the Solar-Stellar Connection
Team leader: Anne-Marie Broomhall (UK)

Investigating the Magnetosphere through Magnetoseismology
Team leader: Peter Chi (US)

A Tropical Width Diagnostics Intercomparison Project
Team leader: Sean Davis (US)

Ultraluminous X-ray Sources: from the Local Group to the Very First Galaxies
Team leader: Tassos Fragos (CH)

Observation-Driven Modelling of Solar Phenomena
Team leader: Klaus Galsgaard (DK)

Towards a New Generation of Massive Star Models: Improving Stellar Evolution Modelling with Hydrodynamics Simulations and Observations
Team leader: Cyril Georgy (CH)

The Physics of the Very Local Interstellar Medium and its Interaction with the Heliosphere
Team leader: Joe Giacalone (US)

MMS and Cluster Observations of Magnetic Reconnection
Team leader: Kyoung-Joo Hwang (US)

The Early Evolution of the Atmospheres of Earth, Venus, and Mars
Team leader: Colin Johnstone (AT)

Using Tidal Disruption Events to Study Super-Massive Black Holes
Team leader: Peter Jonker (NL)

Strong Gravitational Lensing with Current and Future Space Observations
Team leader: Jean-Paul Kneib (CH)

Towards a Unified Solar Forcing Input to Climate Studies
Team leader: Natalie Krivova (GER)

Solving the Prominence Paradox
Team leader: Nicolas Labrosse (UK)

Ionospheric Space Weather Studied by RO and Ground-based GPS TEC Observations
Team leader: Jann-Yenq Liu (TW)

AsteroSTEP - Asteroseismology of STEllar Populations
Team leader: Andrea Miglio (UK)

Understanding the Fate of Binary Systems in the Gaia Era *(ISSI - ISSI Beijing Team)*
Team leader: Nami Mowlavi (CH)

Studies of the Deep Solar Meridional Flow
Team leaders: Markus Roth M. (GER) and Junwei Zhao (US)

Explosive Processes in the Magnetotail: Reconnection Onset and Associated Plasma Instabilities
Team leader: Mikhail Sitnov (US)

Main Belt Comets
Team leader: Colin Snodgrass (UK)

The Role of Shallow Circulations in Organizing Convection and Cloudiness in the Tropics
Team leader: Bjorn Stevens (GER)

Past, Present, and Future of Active Experiments in Space
Team leader: Anatoly Streltsov (US)

Stratospheric Sulfur and its Role in Climate (SSiRC)
Team leader: Larry Thomason (US)

Diagnosing Heating Mechanisms in Solar Flares through Spectroscopic Observations of Flare Ribbons *(ISSI - ISSI Beijing Team)*
Team leader: Hui Tian (CN)

Exploring the Ultra-Low Surface Brightness Universe
Team leader: David Valls-Gabaud (FR)

Towards Dynamic Solar Atmospheric Magneto-Seismology with New Generation Instrumentation
Team leaders: Gary Verth and Richard Morton (UK)

A New View of the Solar-stellar Connection with ALMA
Team leaders: Sven Wedemeyer (NO), Tim Bastian (US), and Hugh Hudson (UK)

The influence of Io on Jupiter's Magnetosphere
Team leader: Ichiro Yoshikawa (JP)

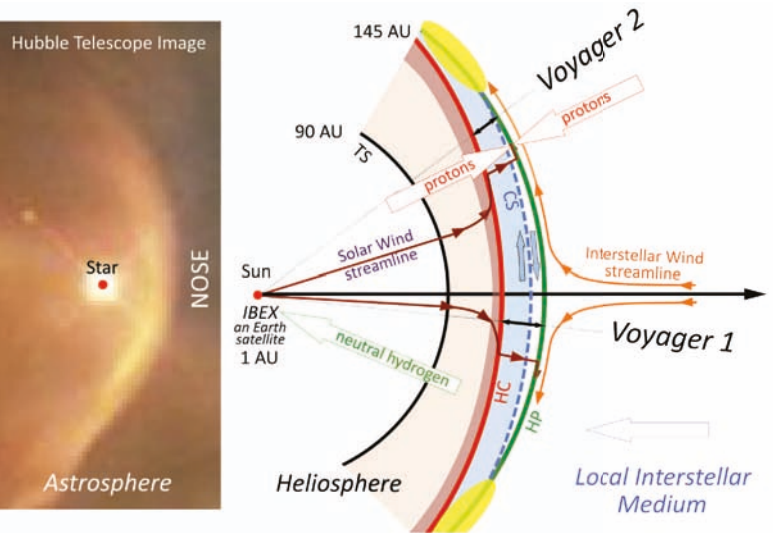
Rossby Waves in Astrophysics
Team leader: Teimuraz Zaqarashvili (AT)

Climate Change in the Upper Atmosphere *(ISSI - ISSI Beijing Team)*
Team leader: Shunrong Zhang (US)

Our Solar System's place in the Milky Way galaxy. (Image Credit: ESA)

Johannes Geiss Fellow 2015 and Visiting Scientists

George Gloeckler and Johannes Geiss have collaborated for several decades. In 2015, George Gloeckler from the University of Michigan (USA) has been elected as the first JGF recipient.



Exploration of our Solar System with "Voyagers" and the "Interstellar Boundary Explorer (IBEX)". (Image Credit: NASA Hubble Telescope)

The Johannes Geiss Fellowship (JGF) is established to attract to ISSI - for limited duration visits - international scientists of stature, who can make demonstrable contributions to the ISSI mission and increase ISSI's stature by their presence and by doing so will honor Johannes Geiss for his founding of ISSI and his contributions to ISSI, and for his many contributions to a broad range of space science disciplines.

George Gloeckler, Johannes Geiss Fellow 2015, answered a few questions about his work:

What was your main project during your several ISSI visits?

George Gloeckler: During my several visits to ISSI I worked primarily with Johannes Geiss on explaining the unusually large variations in the isotope ratio of solar wind helium ($^3He^{++}/^4He^{++}$) we discovered using measurements of $^3He^{++}$ and $^4He^{++}$ with the Solar Wind Ion Composition Spectrometer (SWICS) on Ulysses and the Advanced Composition Explorer (ACE). These measurements of the very rare solar wind $^3He^{++}$ isotope with SWICS, an innovative instrument that Johannes, Len Fisk and I designed and Johannes convinced ESA and NASA to select for flight on Ulysses, are extensive, unique and unmatched. What Johannes and I are currently engaged in is to theoretically explain the observed huge and unexpected variability of $^3He^{++}/^4He^{++}$. There is no one better than Johannes, who pioneered solar wind acceleration of minor, or heavy ions, to tackle this difficult problem. My main contributions are to derive the essential solar wind $^3He^{++}$ parameter (density, flow speed and temperature) that the model envisioned by Geiss must explain.

You mentioned in your Pro ISSI talk (in March 2016) the implication of your model can be tested/approved with the arrivals of new data (in May 2016). What is the latest state of operation?

George Gloeckler: The magnetometer on Voyager 1 measures the direction of the local magnetic field, currently detecting a west (W) direction. The Fisk & Gloeckler model predicts that the direction will soon switch from west to east (E) and that it will remain E until the time when Voyager 1 enters interstel-

lar space, and the field direction will switch once more to the interstellar field direction believed to be north-west (NW). The exact time when the switch from west to east will occur is difficult to predict because it depends on the outward speed of the solar wind at the current Voyager 1 location. Our best estimate of this speed is 4.5 to 5.5 km/s. If the speed is as low as 4.5 km/s we should see the switch by the end May, 2016. If the speed is 5.5 km/s Voyager 1 will detect the direction reversal in late 2017.

Since you have been involved in ISSI's activities from the beginning, how do you think ISSI evolved during those two decades?
George Gloeckler: There is no doubt that ISSI has grown in many ways since its beginning in 1995, the time when I was the first ISSI visiting scientist. Johannes Geiss had a vision for ISSI: Bring together scientists from all over the world for a period of one week to discuss in depth our knowledge and understanding of a ‚hot' topic of mutual interest. To get things started he organized the First ISSI Workshop (November 1995) on "The Heliosphere in the Local Interstellar Medium", and personally persuaded many eminent scientists to attend. This workshop was a resounding success and assured the longevity of ISSI. Johannes realized from the beginning how important it was for visitors and attendees to workshops and team meetings to ‚feel at home', and to this end assembled a small staff of dedicated, helpful and most friendly individuals to achieve this. Since that beginning Johannes and ISSI directors following him have improved on Johannes' vision, and expanded topics for workshops and team meetings to other Space Science Disciplines. As a heliospheric physicist, I always look forward to and enjoy workshops and team meetings on the Heliosphere. ISSI is my second home. As a Johannes Geiss Fellow I love to meet and talk during my more extended visits with the many scientist in different disciplines and learn their latest findings.

Individual Scientists are invited for extended periods to work on scientific subjects at the forefront in areas of interest to ISSI. The results of this research are to be published as books or in major scientific journals, with appropriate acknowledgment to ISSI.

The following scientists worked at ISSI in the course of the twenty-first year:

George Gloeckler, Johannes Geiss Fellow 2015, working periods: 30.8.-19.9.2015, 18.10.- 7.11. 2015 and 10.2.-4.3.2016.

Bill Hartmann, Planetary Science Institute, Tucson, USA, working periods: 6.-23.8.2015 and 8.-26.9.2015.

Ekkehard Kührt, DLR, Berlin, Germany, working period: 1.6.-30.6.2016.

Jeffrey Linsky, University of Colorado, USA, working period: 2.-31.5.2016.

Ken McCracken, IPST, University of Maryland, College Park, USA, working periods: 12.-27.7.2015, 25.8.-23.9.2015, 15.-31.3.2016 and 22.-29.4.2016.

Alexander Milovanov, Associazione EURATOM-ENEA sulla Fusione, Italy, working period: 15.5.-15.6.2016.

Georg Moragas-Klostermeyer, Cosmic Dust Group of the University of Stuttgart, Germany, 15.-20.2.2016.

Jean-Pierre Rozelot, OCA-LAGRANGE-CNRS, University of Nice, France, working period: 9.-13.11.2015.

Gilles Sommeria, WCRP World Climate Research Programme, Geneva, Switzerland, working periods: 7.-9.3.2016, 17.-19.5.2016 and 13.-16.6.2016.

Thomas Zurbuchen, Department of Atmospheric, Oceanic & Space Sciences College of Engineering, University of Michigan, Ann Arbor, USA, working period: 20.-30.9.2015.

International Space Science Institute Beijing

The cooperation between ISSI and ISSI Beijing will continue for another three years. Pictured are (from left to right): Maurizio Falanga (ISSI-BJ Executive Director), Ji Wu (Director General of NSSC), Rosine Lallement (Vice chair ISSI BoT) and Rafael Rodrigo (ISSI Executive Director).

The International Space Science Institute in Beijing (ISSI-BJ) was jointly established by the International Space Science Institute (ISSI) and the National Space Science Center (NSSC) with the support of the International Cooperation Bureau and the Space Science Strategic Project of the Chinese Academy of Science (CAS). ISSI-BJ is a close cooperation partner of ISSI. Both institutes share the same Scientific Committee, the same study tools, and other information of mutual relevance and interest. However, both use independent operational methods and different funding sources. More information can be found on its website: www.issibj.ac.cn.

In 2015 after two years of agreement between ISSI and NSSC, it was necessary for the agreement to be renewed. Therefore, the performance of ISSI-BJ in fulfilling its mandate has been "peer-reviewed" by an ad-hoc visiting committee, composed of internationally renowned scientists. The visiting committee report gave ISSI-BJ high credit and concluded that ISSI-BJ had been gaining an excellent reputation from the international science community. Based on the evaluation, NSSC and ISSI agreed to continue their cooperation with ISSI-BJ. The Board of Trustees of ISSI-BJ and ISSI approved the assessment report, and therefore, on October 23, 2015, Rosine Lallement, representative and vice chair of the Board of Trustees of ISSI, and Ji Wu, Director General of NSSC, CAS signed a new agreement, which confirmed the cooperation of the two sides in the continuation of ISSI-BJ for at least three more years.

In May 2016 ISSI-BJ successfully organized a workshop on "Astronomical Distance Determination in the Space Age". The results of the workshop will be published as refereed papers in Space Science Reviews and in parallel, as volumes of the Space Science Series of ISSI/ISSI-BJ (SSSI). In July 2016 ISSI-BJ organized a forum on "The Link between Solar Wind, Magnetosphere, Ionosphere" to discuss the science and related technology to achieve the scientific goals for the CAS-ESA SMILE mission. To make the forum discussions and its conclusions accessible to the broad scientific communities and the public, the insight gained from these forums is published in the ISSI-BJ TAIKONG Magazine. All issues of TAIKONG can be downloaded from the ISSI-BJ website.

In addition, ISSI-BJ held three scientific seminars, namely "Spatial Resolved Observations of Coronal Type II Radio Bursts with Multiple Emission Lines" given by Ivan Zimovets in July 2015, "The current Goals and Successes of the ESA Mission Rosetta" given by Holger Sierks in August 2015, and "The Ultimate Fate of Planetary Systems" given by Sylvie Vauclair in March 2016. ISSI-BJ is promoting outreach and education activities to the general public and to young scientists as a member of the "Understanding Science" seminars. These informal seminars, held in a cafe in Beijing's university area, are organized in cooperation with the British Royal Society of Chemistry and the Institute of Physics. Around 40 young people attended the Understanding Science lecture on Living with the Furious Star held in December 2015.

At the beginning of 2016, ISSI/ISSI-BJ released a joint Call for Proposals for International Teams in Space and Earth Sciences. The Science Committee has selected six excellent teams and they will hold a series of two one-week meetings at the Institute in Beijing. Three out of these six teams will share the meetings between Beijing and Bern. Together with the 11 selected teams in 2014/2015, ISSI-BJ will be hosting a total of 17 International Teams in the upcoming year.

Maurizio Falanga

In October 2015 ISSI celebrated its 20th Anniversary with a special Symposium and welcomed around 100 guests from all around the world.

Events

21 October 2015: Meeting of the Science Committee.

22-23 October 2015: 20 Years ISSI, Anniversary Symposium.

23 October 2015: Meeting of the Board of Trustees and ISSI Dinner.

28 October 2015: Pro ISSI talk "Titan; The Moon that Thinks It's a Planet" by John Zarnecki.

2 March 2016: Pro ISSI talk "Exploring our Solar System Perimeter from within and afar" by George Gloeckler.

25-26 May 2016: Meeting of the Science Committee, International Space Science Institute, Beijing, China.

8 June 2016: Pro ISSI talk "CaSSIS – A Swiss Camera Goes To Mars!" by Nick Thomas.

ISSI in the media

Creando Paradigmas: Rosetta by L.M. Lara, P.J. Gutiérrez and R. Rodrigo, Boletín Sociedad Española de Astronomía, Vol. 32, 6-17, Summer 2015.

TV Interview with R.-M. Bonnet on the Chinese DAMPE mission, Chinese CCTV Channel, 25 September 2015.

Interview with R.-M Bonnet, Chinese Academy of Sciences Bulletin (Jianlan Song), Vol. 29, No. 4, 25 September 2015.

Article with J. Zarnecki "After Mars, hunt for water and life goes deep into the solar system by R. McKie, the Guardian, 4 October 2015.

Article with V. Sterken "900 Botschaften aus den Tiefen des Alls" by H. Rietz, Neue Zürcher Zeitung, 22 October 2015.

Events and ISSI in the media at a glance

Article with V. Sterken "Interstellarer Staub gewährt neue Einblicke in die Lokale Flocke", der Standard, 27 October 2015.

TV documentary with A. Cazenave "What is the reality of Earth's climate in 2015?", Euronews Channel, 19 November 2015.

"La France et l'Espace, 50 ans de la Conquête Spatiale" with R.-M. Bonnet, French TV Channel RMC Découverte, 26 November 2015.

Article with R. Rodrigo "China desaloja 9.000 pessoas em megaprojeto para procurar extraterrestres" by N Dominguez, El Pais, 19 February 2016.

Lecciones de Rosetta: el éxito de una misión espacial by P.J. Gutiérrez, L.M. Lara and R. Rodrigo, Astronomía, No. 201, p. 25-31, March, 2016.

TV Interview "Legacy of Giotto on Cometary missions up to Rosetta" with R.-M. Bonnet, Interview by Victoria Turk for Motherland VICE Technical and Science UK Channel, 14 March 2016.

TV Interview "Human Exploration of Mars and Mars One" with R.-M. Bonnet by Sierro Christophe for Swiss RTS TV Journal, 16 April 2015.

Interview "Bepi Colombo" with R.-M. Bonnet for Shelios Organization by Miguel Rodrigez Alarcòn, Teide Observatory Spain, 1 May 2016.

Interview "Science Stars of China" with R.-M. Bonnet, Nature, 534, 456, 20 June 2016.

My experience as PhD student at the Alpbach Summer School 2015

The topic of the Summer School Alpbach 2015, held from 14 to 23 July, was quantum and fundamental physics in space with particular attention to: detection of gravitational waves, quantum optics, quantum gravity, and verification of the fundamental principle of equivalence in Einstein's theory of general relativity. They have been explained in the first week through lectures led by European experts, who provided the necessary understanding and the state of art of the prescribed arguments for four teams, each one composed of 15 students, to help them in elaborating an original space mission aimed to improve knowledge of the above mentioned issues. The selected themes were mainly: quantum gravity, namely to figure out the interaction between the microscopic and macroscopic world (three groups), and detection of gravitational waves using laser interferometry (one group). This experience contributed to my scientific formation in several aspects, such as interacting with students from different European countries with various scientific backgrounds, working in a group trying to give your best under the pressure of tight schedules, stimulating the mind toward the future space missions and scientific boundaries, discussing and learning from experts how to tackle a scientific challenge. The proposed topics were really challenging because the actual understanding is still puzzling and thorny. This evident disorientation was reflected also in the behavior of the tutors, who had serious problems to answer some questions and solve some doubts, because we were entering areas never explored before. However, I had the incredible fortune to meet sharp minds, who were able to handle the situation and drive the team along the right course. The overall student spirit could be summarized in this short sentence "be competitive, but share the knowledge whenever someone of a different team asks for your help". For me this is the pure and ideal attitude which drives science, namely although we work for different agencies, we must work together for developing the human knowledge, being a common interest. The days in Alpbach were actually very harsh: wake up early and leave the institute late in the evening. Nevertheless, I had many hilarious moments that contributed to keeping my attention and to lighten the environment. Another great help

Mihaela Nastase, Paolo Cappuccio and Vittorio De Falco worked together during the Alpbach Summer School 2015.

came not only from the tutors, always present for taking care of us, but also from the secretariat staff that organized everything into details giving us material and moral support. The part that deserves particular attention was the final day, when we had to present our project in front of a jury made up of nine people from heterogeneous fields. They asked us not only scientific questions, but also unconventional questions, like "if your mission were approved, what could be a representative tweet?". This taught us how to face the reality of being always ready and prepared. Everybody from the jury and all the tutors were absolutely astonished by the presented projects for the innovative ideas which they contained even though the topics were very difficult. The final award ceremony was the best manner in which to recognize our efforts, encouraging us to continue doing research and release all the stress accumulated in the previous days.

Vittorio De Falco

Staff Activities

Listed are activities in which ISSI staff scientists participated between 1 July 2015 and 30 June 2016. This includes presentations given, meetings attended, honors received, and chairmanships held.

Presentations

3-5 July 2015 – A. Cazenave: Our common future under climate change (3 invited lectures)
1 Earth's energy imbalance, hiatus, ocean heat content and global mean sea level
2. Present day sea level rise
3. Sea level: an essential climate variable a fan indicator of climate change
International Science Conference, UNFCCC, Paris, France.

3-10 August 2015 – R-M. Bonnet: Space Science: Quo Vadis? International Astronomical Union General Assembly, Round Table of IAU Focus Meeting N° 11 "Global Coordination of Ground and Space Astrophysics and Heliophysics", Honolulu, USA.

15 September 2015 – V. De Falco: Approximation of relevant integrals in the Schwarzschild metric with some astrophysical applications, ISSI, Bern, Switzerland.

23 September 2015 – R-M. Bonnet: The Historical Flight of Rosetta to Comet 67p-CG, Invited presentation to the Council Meeting of the Chinese Society of Space Research, Zhengzhou, China.

23 September 2015 – V. De Falco: Approximation of relevant integrals in the Schwarzschild metric with some astrophysical applications, CNOC IX, Monte Porzio Catone, Roma, Italy.

28 September 2015 – A. Cazenave: Sea Level Rise , French-American Climate Talks (FACTS), French Embassy, Miami, USA.

30 September 2015 – R. Rodrigo: OSIRIS on-board Rosetta: Activity and surface morphology of comet 67P/C-G, Space Research Institute, Moscow, Russia.

1 October 2015 – V. Sterken: Probing interstellar dust properties by in-situ measurements, simulations and experiments, Laboratory Astrophysics Workshop, Heidelberg, Germany.

2 October 2015 – R-M. Bonnet: IKI 50 years of Vision, science and international Friendship, Russian Academy of Sciences, Moscow, Russia.

8 October 2015 – R. Rodrigo: Nucleus morphology and activity of comet 67P/Churyumov-Gerasimenko observed by OSIRIS on board Rosetta, Centro de Astrobiología, Madrid, Spain.

16 October 2015 – R-M. Bonnet: European-Chinese cooperation in Space Science, History and Perspectives, Cluster-Double Star 20th Anniversary, Venice, Italy.

6 November 2015 – R-M. Bonnet: Some words about Georges, Conference in Honour of Prof. Georges Meylan, Observatoire de Severny, Switzerland.

11 November 2015 – A. Cazenave: The Oceans observed from Space, Royal Swedish Academy, Stockholm, Sweden.

17 November 2015 – R-M. Bonnet: Rosetta, Philae, L'Europe des succès, Comité Européen, Marseille, France.

18 November 2015 – A. Cazenave: Océans, glaces et niveau de la mer, Swiss Embassy, Paris, France.

23 November 2015 – M. Falanga: General introduction to ISSI and ISSI-BJ, National Space Organization (NSPO), Taipei, Taiwan.

3 December 2015 – V. Sterken: Charged interstellar dust in the heliosphere: trajectory simulations and a legacy of 16 years of Ulysses measurements, Seminar, Boston University, USA.

10 December 2015 – M. Falanga: PR effect during a type-I X-ray burst, OAR, Rome, Italy.

10 December 2015 – V. Sterken: "Flux of ISM in the Jovian system" and "the Europa M5 Initiative", SUDA open team meeting, Boulder, Colorado, USA.

15 December 2015 – V. De Falco: Approximation of relevant integrals in the Schwarzschild metric with some astrophysical applications, the 28th Texas Symposium on Relativistic Astrophysics, Geneva, Switzerland.

18 December 2015 – A. Cazenave: Session on 'water resources', Fall Meeting AGU, San Francisco, USA.

18 December 2015 – V. Sterken: New insights in the interstellar dust properties and its interaction with the heliosphere through data, simulations and experiments, AGU, San Francisco, USA.

24 February 2016 – V. Sterken: Probing the local interstellar cloud through interstellar dust measurements in the solar system, Seminar IRAP, Toulouse, France.

1 March 2016 – V. Sterken: "The additional payloads option for the Europa M5 Initiative" and "Exosphere WG wrap-up", 3rd Europa Initiative Meeting, Madrid, Spain.

2 March 2016 – A. Cazenave: Conference 'Global climate observation, the road to the future' GCOS (Global Climate Observing System), Amsterdam, The Netherlands.

14 March 2016 – R-M. Bonnet: From 1P to 67P With Giotto and Rosetta, 50th ESLAB Symposium "From Giotto to Rosetta", Leiden, The Netherlands.

16 March 2016 – N. Champollion: Sea Level Observation, The Revolution of Space Gravimetry Remote Sensing, Colloquium in Climatology, Climate Impact and Remote Sensing, University of Bern, Switzerland.

29 March 2016 – N. Champollion: Snow Surface Evolution from Observations at Dome C, Antarctica, Colloquium of the Institut fur Schnee und Lawinenforschung (SLF), Davos, Switzerland.

7 April 2016 – R. von Steiger: The Legacy of Two Decades of Observations with SWICS on Ulysses, Seminar talk, University of Michigan, Ann Arbor, USA.

11 April 2016 – R-M. Bonnet: Safeguarding Scientific Mission-related Records, ESA-NSF Seminar on the "Heritage of the European Science Foundation", Historical Archives Institute of the European Union, Florence, Italy.

13 April 2016 – V. De Falco: Accretion disks in Kerr metric including the Poynting-Robertson effect, ISSI, Bern, Switzerland.

14 April 2016 – V. Sterken: Impact ionisation experiments with porous cosmic dust particles, PIG team meeting, Group of N. Thomas, Univ. of Bern, Switzerland.

20 April 2016 – V. De Falco: Accretion disks in Kerr metric including the Poynting-Robertson effect, University of Opava, Opava, Czech Republic.

20 April 2016 – M. Falanga: Observations and theory of type-I X-ray bursts, Silesian University in Opava, Czech Republic.

20 April 2016 – V. Sterken: Impact ionisation experiments with porous cosmic dust particles, EGU, Vienna, Austria.

29 April 2016 – R-M. Bonnet: Giotto, Rosetta, Philae, 30 ans d'Exploration des comètes, Association Quasar, Gap, France.

9 May 2016 – A. Cazenave: Observing the oceans from space, ESA Living Planet Symposium, keynote lecture, Prague, Czech Republic.

12 May 2016 – R-M. Bonnet: Closing remarks, 20th anniversary of SoHO observations, Institut d'Astrophysique Spatiale (IAS), Orsay, France.

24-26 May 2016 – A. Bykov: The first science conference dedicated to the X-ray Imaging Polarimetry Explorer, Valencia, Spain.

3 June 2016 – R-M. Bonnet: Relations avec Jean-Louis Steinberg dans le cadre du CNES et de l'ESA, Ceremony in honor of J-L. Steinberg, Observatoire de Paris, France.

3 June 2016 – R-M. Bonnet: Hubert Curien, Ceremony in honor of Prof. H. Curien and inauguration of the "Street Hubert Curien", Vernon, France.

28 June 2016 – R. von Steiger: Stream-Stream and Corotating Interaction Regions, ISSI Workshop on Space Weather, Bern, Switzerland.

Meetings

11-15 July 2016 – A. Bykov: The 6th International Symposium on High-Energy Gamma-Ray Astronomy, Heidelberg, Germany

13-14 July 2015 – R. Rodrigo: Alpbach Summer School, Austria.

14-23 July 2015 – R-M. Bonnet: Alpbach Summer School Jury Chair, Alpbach, Austria

14-23 July 2015 – V. De Falco: Alpbach Summer School, Austria.

3-10 August 2015 – R-M. Bonnet: International Astronomical Union General Assembly, Participation to the Round Table of IAU Focus Meeting N° 11 on "Global Coordination of Ground and Space Astrophysics and Heliophysics", Honolulu, USA.

Staff Activities

17-21 August 2015 – V. Sterken: Cosmic dust meeting Tokyo, Japan.

24-28 August 2015 – V. Sterken: "From dust to planets andgeology", CSH summer school Leukerbad, Switzerland.

22-25 September 2015 – V. De Falco: CNOC IX participant, Monte Porzio Catone, Roma, Italy.

20-26 September 2015 – R-M. Bonnet: Invited presentation to the Council Meeting of the Chinese Society of Space Research, Zhengzhou, China.

27 September - 2 October 2015 – M. Blanc: Ionosphere-magnetosphere coupling studies with Juno and Cassini proximal orbits, European Planetary Science Congress 2015, Nantes, France.

29 September - 1 October 2015 – A. Cazenave: Climate Change Initiative Meeting, ESA/ESRIN, Frascati, Italy.

29 September – 2 October – R. Rodrigo: Space Science: Yesterday, Today and Tomorrow, IKI 50th Anniversary Conference, Invited Lecture, Moscow, Russia.

1-4 October 2015 – R-M. Bonnet: Round Table on "Space Science, Quo Vadis?", Institute of Cosmic Research (IKI), Celebration of IKI's 50th anniversary, Moscow, Russia.

12-16 October 2015 – R-M. Bonnet: Cluster-Double Star 20th Anniversary, Venice, Italy.

15-16 October 2015 – M. Falanga: GA meeting "Swiss Society for Astrophysics and Astronomy", Locarno, Switzerland.

2-6 November 2015 – R. Rodrigo: Osiris Full Team Meeting, Padova, Italy.

3 November 2015 – R-M. Bonnet: Last Editorial meeting of "Our Space Environment", EPFL, Lausanne, Switzerland.

6 November 2015 – R-M. Bonnet: Conference in Honour of Prof. Georges Meylan, Observatoire de Severny, Switzerland.

7 November 2015 – R. von Steiger: Editorial Committee of Space Science Reviews, New York, USA.

10-11 November 2015 – J. Zarnecki: Session Chair in joint ESA-ERC scientific networking event/ Workshop on "Frontiers of Space Science and Technology", ESTEC, Noordwijk, The Netherlands.

11-14 November 2015 – R. Rodrigo: Science and Management Advisory Committee, Arecibo Observatory, Puerto Rico, USA.

23-24 November 2015 – M. Falanga: Visit, National Space Organization (NSPO), Taipei, Taiwan.

26-29 November 2015 – V. Sterken: Europa M5 Initiative, Q&A session, ESA/ESTEC, Noordwijk, the Netherlands.

2-9 December 2015 – V. Sterken: working visit, Dept. Astronomy, Boston University, USA.

3 December 2015 – R-M. Bonnet: Annual Meeting Swiss Space Center, Presentation of "Our Space Environment" book, EPFL, Lausanne, Switzerland.

10-11 December 2015 – M. Falanga: Group meeting at the Astronomical observatory in Rome, Italy.

9-12 December 2015 – V. Sterken: SUDA open team meeting, Boulder, Colorado, USA.

9 December 2015 – R-M. Bonnet: First Alpbach summer school 2016, first Program Committee meeting, Vienna, Austria.

13-18 December 2015 – V. De Falco: the 28th Texas Symposium on Relativistic Astrophysics participant, Geneva, Switzerland.

14-19 December 2015 – A. Cazenave, V. Sterken: AGU Conference, San Francisco, USA.

15 December 2015 – R. Rodrigo: Jury of the Awards Spanish Royal Society of Physics – BBVA Foundation, Madrid, Spain.

21-23 December 2015 – A. Bykov: High Energy Astrophysics Conference, Space Research Institut, Moscow, Russia.

13 January 2016 – R-M. Bonnet: 8th Explornova Working Group Meeting, Institut d'Astrophysique de Paris (IAP), Paris, France.

21 January 2016 – V. Sterken: First Europa M5 Initiative workshop (AKON penetrator), London, UK.

25 January 2016 – R-M. Bonnet: Second Alpbach summer school 2016, second Program Committee meeting, Vienna, Austria.

16 February 2016 – R-M. Bonnet: 9th Explornova Working Group Meeting, IAP, Paris, France.

22 February 2016 – M. Falanga: Executive Committee meeting of the A&A Journal, Vienna, Austria.

22-24 February 2016 – V. Sterken: Second Europa M5 Initiative workshop, Toulouse, France.

23-26 February 2016 – R. Rodrigo: Osiris Full Team Meeting, Schloss Ringberg, Kreuth, Germany.

29 February – 1 March 2016 – R. Rodrigo, V. Sterken: Europa Initiative Workshop #3, Madrid, Spain.

2-4 March 2016 – A. Cazenave: Global climate observation, the road to the future, GCOS (Global Climate Observing System), Amsterdam, The Netherlands.

8 March 2016 – R. Rodrigo: MiARD kick-off Meeting, University of Bern, Switzerland.

14 March 2016 – R-M. Bonnet: 50th ESLAB Symposium "From Giotto to Rosetta", Leiden, The Netherlands.

21-25 March 2016 – M. Blanc, V. Sterken: The Europa Initiative for ESA's M5 Call (EI-M5): A Potential European Contribution to NASA's Europa Multiple-Flyby Mission, 47th Lunar and Planetary Science Conference, Texas, USA.

22 March 2016 – R-M. Bonnet: 10th Explornova Working Group Meeting, IAP, Paris, France.

4-15 April 2016 – R. von Steiger: Visiting Research Scientist, University of Michigan, Ann Arbor, USA.

7 April 2016 – R-M. Bonnet: Institut Français d'Histoire de l'Espace (IFHE), Presentation of IFHE's book on Earth Observations, CNES, Paris, France.

11 April 2016 – R-M. Bonnet: ESA-NSF Seminar on the "Heritage of the European Science Foundation", Historical Archives Institute of the European Union, Florence, Italy.

17-22 April 2016 – M. Blanc, V. Sterken: The Europa Initiative for ESA's cosmic vision: a potential European contribution to NASA's Europa mission, EGU General Assembly, Vienna, Austria.

19 April 2016 – R-M. Bonnet: Solar Orbiter Contamination Control Review, ESTEC, Noordwijk, The Netherlands.

19-21 April 2016 – M. Falanga: Group meeting at the Silesian University in Opava, Czech Republic.

25 April 2016 – R-M. Bonnet: Meeting with Prof. Wörner, ESA Director general, about "The Moon Village", ESA Head Office, Paris, France.

ISSI Earth Science Director Anny Cazenave during a presentation at the ISSI Anniversary Symposium in October 2015.

25 April 2016 – A. Cazenave: Joint Science Committee, WCRP (World Climate Research Programme), Geneva, Switzerland.

28-29 April 2016 – M. Falanga: Board of Directors meeting of the A&A Journal, Prague, Czech Republic.

9-13 May 2016 – A. Cazenave: ESA Living Planet Symposium, Prague, Czech Republic.

12 May 2016 – R-M. Bonnet: 20th anniversary of SoHO observations, Institut d'Astrophysique Spatiale (IAS), Orsay, France.

24-26 May 2016 – A. Bykov: The first science conference dedicated to the X-ray Imaging Polarimetry Explorer, Valencia, Spain.

23-27 May 2016 – R-M. Bonnet, A. Cazenave, M. Falanga, S. Wenger: ISSI-BJ Board of Trustees annual meeting, Beijing, China.

3 June 2016 – R-M. Bonnet: Ceremony in honor of J-L. Steinberg, Observatoire de Paris and Ceremony in honor of Prof. H. Curien and inauguration of the "Street Hubert Curien", Vernon, France.

17 June 2016 – N. Champollion: Meeting of the Association of Polar Early Career Scientists (APECS) Switzerland, Jungfraujoch, Switzerland.

21 June 2016 – R-M. Bonnet: 12th Explornova Working Group Meeting, IAP, Paris, and Meeting on Planetary Protection, COSPAR HQ, CNES Paris, France.

Staff Activities

Chairman- and Memberships, Honors

R.-M. Bonnet:
- Administrateur de l'Association Française d'Astronomie, France
- Vice-President of Institut Français d'Histoire de l'Espace, France
- Member of the Association of Universities Inc. Board of Trustees, Washington DC, USA
- President of the Alpbach Summer School Jury 2015, Austria
- Expert and Consultant to the ESA Director General and the Director of Science and Robotic Exploration for the - ESA ExoMars Missions, and Contamination control of the ESA Solar Orbiter Mission
- Co-President of the ESA Solar Contamination Review of the ESA Solar Orbiter Mission
- Senior Advisor to the NSSC Director General for ISSI-BJ matters

A. Cazenave:
- Member of the Joint Scientific Committee of the World Climate Research Programme
- Member of the panel "Strategic NASA Science Missions" of the National Research Council, The National Academies, USA
- Chair of the 'Whitten Medal' Committee of the American Geophysical Union
- Member of the Conseil d'Administration of Meteo-France
- Member of the Conseil d Orientation Strategique of the Institut de Recherche pour le Développement
- Science leader of the 'Climate Change Initiative' sea level project of ESA
- Guest editor of PNAS and Surveys in Geophysics
- Vice chair of the section "Sciences de l Univers" of the French Academy of sciences
- Strategic NASA Science missions, NRC (National Research Council), The National Academies, USA

M. Falanga:
- Member of the Astronomy & Astrophysics Journal Board of Directors & Executive Committee, Swiss representative since 2011
- Member of the Editorial Board for Advances in Astronomy Journal
- Member of the International Academy of Astronautics (IAA)

R. Rodrigo:
- Member of the Arecibo Observatory Science and Management Advisory Committee
- Member of the International Academy of Astronautics Scientific Activities Committee
- Member of the Editorial Board of Space Science Reviews
- Member of the Scientific Advisory Committee of the BBVA Foundation
- Co-Investigator of the Instrument "Giada" of the ESA Mission Rosetta for the exploration of minor bodies in the Solar System
- Spanish Lead Scientist of the "Osiris" instrument of the ESA Mission Rosetta for the exploration of minor bodies in the Solar System
- Co-Investigator of the BepiColombo Laser Altimeter of the ESA Mission BepiColombo to planet Mercury
- Co-Investigator of the Instruments Janus and Gala of the ESA Mission JUICE for the exploration of the Jovian system

R. von Steiger:
- Review of an EC FP7 Space Research Project, Brussels, January 22, 2016
- Review of proposals for SNF professorships, July 4, 2016

J. Zarnecki:
- President of the Royal Astronomical Society
- Chair of ESA's Solar System & Exploration Working Group (SSEWG)
- Member of ESA's Space Science Advisory Committee (SSAC)
- Member of ESA's Human Exploration & Science Advisory Committee (HESAC)
- Member of Council of The Institute of Physics
- Member of the Google Lunar XPrize Judging Panel

Listed are all papers written or co-authored by ISSI staff that were submitted or that appeared between 1 July 2015 and 30 June 2016.

Abbo, L., L. Ofman, S.K. Antiochos, V.H. Hansteen, L. Harra, Y.-K. Ko, G. Lapenta, B. Li, P. Riley, L. Strachan, R. von Steiger, Y.-M. Wang, Slow Solar Wind: Observations and Modeling, Space Sci. Rev., doi:10.1007/s11214-016-0264-1, in press, 2016.

Ablain, M., J.F. Legeais, P. Prandi, L. Fenoglio-Marc, M. Marcos, J. Benveniste, A. Cazenave, Altimetry-based sea level, global and regional, submitted, Surv. Geophys., 2016.

Altobelli, N., F. Postberg, K. Fiege, M. Trieloff, H. Kimura, V. Sterken, S. Hsu, J. Hillier, N. Khawaja, G. Moragas-Klostermeyer, J. Blum, M. Burton, R. Srama, S. Kempf, E. Gruen, Flux and composition of interstellar dust at Saturn from Cassini's Cosmic Dust Analyzer, Science, 352, 6283, 312-318, 2016.

Auger, A.-T., et al. (including: R. Rodrigo), Geomorphology of the Imhotep region on comet 67P/Churyumov-Gerasimenko from OSIRIS observations, Astron. Astrophys., 583, A35, 2015.

Bernardini, F., D. de Martino, K. Mukai, G. Israel, M. Falanga, G. Ramsay, N. Masetti, Swift J0525.6+2416 and IGR J04571+4527: two new hard X-ray selected magnetic cataclysmic variables identified with XMM-Newton, MNRAS, 453, 3, 2015.

Bertini, I. et al. (including: R. Rodrigo), Search for satellites near comet 67P/Churyumov-Gerasimenko using Rosetta/OSIRIS images, Astron. Astrophys., 583, A19, 2015.

Bonnet R.-M., C. Nicollier, V. Gass (eds.), Our Space Environment, EPFL Press, ISBN 9782940222889, 2015.

Bonnet, R.-M., IKI 50 years, 50 years of Vision, Science and International Friendship, Russian Academy of Sciences, in press, 2016.

Bonnet, R.-M., D. Spergel, R. Williams et al, FM11 Global Coordination: What are the next steps, IAU Commissions D, E, F, G, H, J reports, 2016.

Bozzo, E., L. Oskinova, A. Feldmeier, M. Falanga, Clumpy wind accretion in supergiant neutron star high mass X-ray binaries, Astron. Astrophys., 589, A102, 2016.

Bykov, A.M., D.C. Ellison, P.E. Gladilin, S.M. Osipov, Ultra-hard spectra of PeV neutrinos from supernovae in compact star clusters, MNRAS, 453, 1, 113-121, 2015.

Cazenave, A. et al., Foreword: International Space Science Institute (ISSI) Workshop on Remote Sensing and Water Resources, Surv. Geophys., 37, 2, 191, 2016.

Cazenave, A. et al. (eds.), Special Issue: Remote Sensing and Water Resources, Surv. Geophys., 37, 2, 191-527, 2016.

Carret A., J. Johannessen, O. Andersen, M. Ablain, P. Prandi, A. Blazquez, A. Cazenave, Arctic sea level during the altimetry era, submitted, Surv. Geophys., 2016.

Chambers D., A. Cazenave, N. Champollion, H. Dieng, W. Llovel, R. Forsberg, K. von Schuckmann, Y. Wada, Evaluation of the global mean sea level budget between 1993 and 2015, Surv. Geophys., in press, 2016.

Cliver, E.W., R. von Steiger, Minimal Magnetic States of the Sun and the Solar Wind: Implications for the Origin of the Slow Solar Wind, Space Sci. Rev., doi:10.1007/s11214-015-0224-1, 2015.

Cremonese, G., et al. (including: R. Rodrigo), Photometry of dust grains of comet 67P and connection with nucleus regions, Astron. Astrophys., 588, A59, 2016.

Davidsson, B.J.R., et al. (including: R. Rodrigo), Orbital elements of material surrounding comet 67P/Churyumov-Gerasimenko, Astron. Astrophys., 583, A16, 2015.

Davidson, B.J.R., et al. (including: R. Rodrigo), The primordial nucleus of comet 67P/Churyumov-Gerasimenko, Astron. Astrophys., in press, 2016.

De Falco, V., M. Falanga, L. Stella, Approximate analytical calculations of photon geodesics in the Schwarzschild metric, Astron. Astrophys., in press, 2016.

Della Corte, V., et al. (including: R. Rodrigo, J. Zarnecki). GIADA – Shining a light on monitoring of comet dust ejections from 67/P Churyumov-Gerasimenko nucleus, Astron. Astrophys., 583, A13, 2015.

Dieng, H., N. Champollion, A. Cazenave, Y. Wada, E. Schrama, B. Meyssignac, Total land water storage change over 2003-2013 estimated from a global mass budget approach, Environmental Res. Lett., 10, 124010, doi:10.1088/1748-9326/10/12/124010, 2015.

Staff Publications

Dieng H., A. Cazenave, B. Meyssignac, K. von Schuckmann, H. Palanisamy, Sea and land surface temperatures, ocean heat content Earth's energy imbalance and net radiative forcing, submitted, Int. J. Climatol., 2016.

Ellison, D.C., D.C. Warren, A.M. Bykov, Particle spectra and efficiency in nonlinear relativistic shock acceleration - survey of scattering models, MNRAS, 456, 3, 3090-3099, 2016.

El-Maarry, M.R. et al. (including: R. Rodrigo), Fractures on comet 67P/Churyumov-Gerasimenko observed by Rosetta/OSIRIS, Geophys. Res. Lett., 42, 13, 5170-5178, 2015.

El-Maarry, M.R. et al. (including: R. Rodrigo), Regional Surface Morphology of Comet 67P/Churyumov-Gerasimenko from Rosetta/OSIRIS images, Astron. Astrophys., 583, A26, 2015.

El-Maarry, M.R. et al. (including: R. Rodrigo), Regional surface morphology of comet 67P-Churyumov-Gerasimenko from Rosetta/OSIRIS images: The Southern Hemisphere, Astron. Astrophys., in press, 2016.

Grousin, O. et al. (including: R. Rodrigo), Gravitational slopes, geomorphology and material strengths of the nucleus of comet 67P/Churyumov-Gerasimenko from OSIRIS images, Astron. Astrophys., 583, A32, 2015.

Groussin, O. et al. (including: R. Rodrigo), Temporal morphological changes in the Imhotep region of comet 67P-Churyumov-Gerasimenko, Astron. Astrophys., 583, A36, 2015.

Famiglietti, J., A. Cazenave, A. Eicker, J.T. Reager, M. Rodell, I. Velicogna, Satellites Provide the 'Big Picture' for Global Hydrology, Science, 349, 6249, 684-685, 2015.

Fornasier, S. et al. (including: R. Rodrigo), Spectro-photometric properties of the 67P/Churyumov-Gerasimenko's nucleus from the OSIRIS instrument onboard the ROSETTA spacecraft, Astron. Astrophys., 583, A30, 2015.

Fulle, M. et al. (including: R. Rodrigo), Rotating dust paeticles in the coma of comet 67P/Churyumov-Gerasimenko, Astron. Astrophys., 583, A14, 2015.

Fulle, M. et al. (including: R. Rodrigo, J. Zarnecki), Evolution of the Dust Size Distribution of Comet 67P/Churyumov–Gerasimenko from 2.2 au to Perihelion, The Astrophysical Journal, 821(1), article no. 19, 2016.

Gutiérrez, P.J. et al. (including: R. Rodrigo), A possible interpretation of the precession of comet 67P-Churyumov-Gerasimenko, Astron. Astrophys., 590, A46, 2016.

Ip, W.-H. et al. (including: R. Rodrigo), Physical property and dynamical relation of the circular depressions on comet 67P-Churyumov-Gerasimenko, Astron. Astrophys., in press, 2016.

Jorda, L. et al. (including: R. Rodrigo), The global shape, density and rotation of comet 67P-Churyumov-Gerasimenko from pre-perihelion Rosetta/OSIRIS observations, Icarus, 277, 257-278, 2016.

Keller, H.U. et al. (including: R. Rodrigo), Insolation, erosion, and morphology of comet 67P/Churyumov-Gerasimenko, Astron. Astrophys., 583, A34, 2015.

Kropotina, Y.A., A.M. Bykov, A.M. Krasilshchikov, K.P. Levenfish, Relaxation of Heavy Ions in Collisionless Shock Waves in Cosmic Plasma, Techn. Phys., 61, 4, 517-524, 2016.

Krüger, H., P. Strub, E. Grün, V.J. Sterken, 16 Years of Ulysses Interstellar Dust, Measurements in the Solar System: I. Mass Distribution and Gas-to-Dust Mass Ratio, Astrophys. J., 812, 139, 2015.

La Forgia, F. et al. (including: R. Rodrigo), Geomorphology and spectrophotometry of Philae's landing site on comet 67P/Churyumov-Gerasimenko, Astron. Astrophys., 583, A 41, 2015.

Lara, L.M. et al. (including: R. Rodrigo), Large scale dust jets in the coma of 67P/Churyumov-Gerasimenko as seen by the OSIRIS instrument on board Rosetta, Astron. Astrophys., 583, A9 , 2015.

Lin, Z.-Y. et al. (including: R. Rodrigo), Morphology and dynamics of jets of comet 67/P Churyumov-Gerasimenko: Early phase development, Astron. Astrophys., 583, A11, 2015.

Lin, Z.-Y. et al. (including: R. Rodrigo), Observations and analysis of a curved jet in the coma of comet 67P-Churyumov-Gerasimenko, Astron. Astrophys., 588, L3, 2016.

Lopez, T., R. Antoine, Y. Kerr, J. Darrozes, M. Rabinowicz, G. Ramillien, A. Cazenave, P. Genthon, Subsurface hydrology in the Lake Chad basin from space-based and hydrogeological data, Surv. Geophys., 37, 2, 471-502, 2016.

Lucchetti, A. et al. (including: R. Rodrigo). Characterization of the Abydos region through OSRIS high-resolution images in support of CIVA measurements, Astron. Astrophys., 585, L1, 2016.

Marcowith, A., A. Bret, A.M. Bykov, M.E. Dieckman, L. Drury, B. Lembege, M. Lemoine, G. Morlino, G. Murphy, G. Pelletier, I. Plotnikov, B. Reville, M. Riquelme, L. Sironi, A. Stockem Novo, The microphysics of collisionless shock waves, Rep. Prog. Phys., 79, 4, 046901, 2016.

Marzeion, B. et al. (including: N. Champollion), Observation of glacier mass changes on the global scale and its contribution to sea-level change, Surv. Geophys., submitted, 2016.

Massironi, M. et al. (including: R. Rodrigo), Two independent and primitive envelopes of the bilobate nucleus of comet 67P, Nature, 526, 402-405, 2015.

Molkov, S.V., A.A. Lutovinov, M. Falanga, Determination of parameters of Long-Term variability of the X-ray pulsar LMC X-4, Astron. Lett., 41, 562, 2015.

Moreno, F. et al. (including: R. Rodrigo), The dust environment of comet 67P-Churyumov-Gerasimenko from Rosetta OSIRIS/GIADA and VLT observations in the 4.5 to 2.9 AU heliocentric distance range inbound, Astron. Astrophys., 587, A155, 2016.

Oklay, N. et al. (including: R. Rodrigo). Characterization of OSIRIS NAC filters for the interpretation of multispectral data of comet 67P/Churyumov-Gerasimenko. Astron. Astrophys., 583, A45, 2015.

Palanisamy, H., B. Meyssignac, A. Cazenave, T. Delcroix, Is the anthropogenic sea level fingerprint already detectable in the Pacific Ocean?, Environ. Res. Lett., 10, 8, 2015.

Pajola, M. et al. (including: R. Rodrigo), The size-frequency distribution of boulders ≥ 7 m on 67P/Churyumov-Gerasimenko comet, Astron. Astrophys., 583, A37, 2015.

Pajola, M. et al. (including: R. Rodrigo), The Aswan site on comet 67P: Geomorphology, boulder evolution and spectrophotometry, Astron. Astrophys., in press, 2016.

Pajola, M. et al. (including: R. Rodrigo), The southern hemisphere of 67P/Churyumov-Gerasimenko: analysis of the pre-perihelion size-frequency distribution of boulders ≥7 m, Astron. Astrophys., in press, 2016.

Paton, M.D., S.F. Green, A.J. Ball, J.C. Zarnecki, Detection of structure in asteroid analogue materials and Titan's regolith by a landing spacecraft, Adv. Space Res., 58, 415-437, 2016.

Paton, M.D., S.F. Green, A.J. Ball, J.C. Zarnecki, A.-M. Harri, Using the inertia of spacecraft during landing to penetrate regoliths of the Solar System, Adv. Space Res., 56, 6, 1242–1263, 2015.

Petrov, A.E., A.M. Bykov, Model of dynamical structures in synchrotron images of pulsar wind nebulae, J. Phys. Conf. Ser., 661, 1, 012010, 2015.

Pilleri, P., D.B. Reisenfeld, T.H. Zurbuchen, S. Lepri, P. Shearer, J.A. Gilbert, R. von Steiger, R.C. Wiens, Variations in solar wind fractionation as seen by ACE/SWICS and the implications for Genesis, Astrophys. J., 812, 1, doi:10.1088/0004-637X/812/1/1, 2015.

Pommerol, A. et al. (including: R. Rodrigo), OSIRIS observations of meter-size exposures oh H20 ice at the surface of 67/P Churyumov-Gerasimenko and interpretation using laboratory experiments, Astron. Astrophys., 583, A25, 2015.

Preusker, F. et al. (including: R. Rodrigo), Shape model, reference system definition, and cartographic mapping standards for comet 67/P Churyumov-Gerasimenko – Stereo-photogrammetric analysis of Rosetta/OSIRIS image data, Astron. Astrophys., 583, A33, 2015.

Rickman, H. et al. (including: R. Rodrigo), Comet 67/P Churyumov-Gerasimenko, Constraints on its origin from OSIRIS observations, Astron. Astrophys., 583, A44, 2015.

Shi, X. et al. (including: R. Rodrigo), Sunset jets observed on comet 67P-Churyumov-Gerasimenko sustained by surface thermal lag, Astron. Astrophys., 586, A7, 2016.

Sterken, V.J., P. Strub, H. Krüger, R. von Steiger, P. Frisch, 16 Years of Ulysses Interstellar Dust Measurements in the Solar System: III. Simulations and data unveil new insights into local Interstellar Dust, Astrophys. J., 812, 141, 2015.

Strub, P., H. Krüger, V.J. Sterken, 16 years of Ulysses Interstellar Dust Measurements in the Solar System: II. Fluctuations in the Dust Flow from the Data, Astrophys. J., 812, 140, 2015.

Thomas N. et al. (including: R. Rodrigo), Redistribution of particles across the nucleus of comet 67/P Churyumov-Gerasimenko, Astron. Astrophys., 583, A17, 2015.

Tubiana, C. et al. (including: R. Rodrigo), Scientific assessment of the quality of OSIRIS images, Astron. Astrophys., 583, A46, 2015.

Vincent, J.-B., et al. (including: R. Rodrigo), Active pits formed by sinkhole collapse reveal large heterogeneities in comet 67P, Nature, 523, 63-66, 2015.

Staff Publications

Vincent, J.-B. et al. (including: R. Rodrigo), Are fractured cliffs the sources of cometary dust jets? Insights from OSIRIS/Rosetta at 67P, Astron. Astrophys., 587, A14, 2016.

von Schuckmann, K., M.D. Palmer, K.E. Trenberth, A. Cazenave, D. Chambers, N. Champollion et al., Earth's energy imbalance: an imperative for monitoring, Nature Climate Change, 6, 138-144, 2016.

von Steiger, R., T.H. Zurbuchen, Solar Metallicity Derived from in Situ Solar Wind Composition, Astrophys. J., 816, 13, doi:10.3847/0004-637X/816/1/13, 2016.

Zurbuchen, T.H., M. Weberg, R. von Steiger, R.A. Mewaldt, S.T. Lepri, S.K. Antiochos, Composition of Coronal Mass Ejections, Astrophys. J., in press, 2016.

Zurbuchen, T.H., R. von Steiger, S. Bartalev, X. Dong, M. Falanga, R. Fléron, A. Gregorio, T.S. Horbury, D. Klumpar, M. Küppers, M. Macdonald, R. Millan, A. Petrukovich, K. Schilling, J. Wu, and J. Yan, Performing High-Quality Science on CubeSats, Space Research Today, in press, 2016.

Listed are all papers written or co-authored by ISSI visitors, with acknowledgment to ISSI, that appeared or were accepted for publication in refereed journals between 1 July 2015 and 30 June 2016.

Antolin, P., G. Vissers, T.M.D. Pereira, L. Rouppe van der Voort, E. Scullion, The Multi-Thermal and Multi-Stranded Nature of Coronal Rain, Astrophys. J., 806, 1, 2015.

Antolin, P., T.J. Okamoto, B. De Pontieu, H. Uitenbroek, T. Van Doorsselaere, T. Yokoyama, Resonant Absorption of Transverse Oscillations and Associated Heating in a Solar Prominence II. Numerical Aspects, Astrophys. J., 809, 2015.

Arsenovic, P., E. Rozanov, A. Stenke, B. Funke, J.-M. Wissing, K. Mursula, F. Tummon, T. Peter, The Influence of Middle Range Energy Electrons on Atmospheric Chemistry and Regional Climate, Atmos. Sol. Terr. Phys., in press, 2016.

Artamonov, A.A., A.L. Mishevb, I.G. Usoskin, Atmospheric ionization induced by precipitating electrons: Comparison of CRAC: EPII model with a parametrization model, J. Atmos. Sol. Terr. Phys., in press, 2016.

Badman, S.V., B. Bonfond, M. Fujimoto, R.L. Gray, Y. Kasaba, S. Kasahara, T. Kimura, H. Melin, J.D. Nichols, A.J. Steffl, C. Tao, F. Tsuchiya, A. Yamazaki, M. Yoneda, I. Yoshikawa, K. Yoshioka, Weakening of Jupiter's main auroral emission during January 2014, Geophys. Res. Lett., 43, 3, 988-997, 2016.

Baglio, M.C., P. D'Avanzo, S. Campana, F. Coti Zelati, S. Covino, D.M. Russell, Different twins in the millisecond pulsar recycling scenario: Optical polarimetry of PSR J1023+0038 and XSS J12270-4859, Astronom. Astrophys., 591, A101, 2016.

Ballester, J.L., M. Carbonell, R. Soler, J. Terradas, Prominence oscillations: Effect of a time-dependent background temperature, Astron. Astrophys., in press, 2016.

Battaglia, G., M. Steinacher, F. Joos, A probabilistic assessment of calcium carbonate export and dissolution in the modern ocean, Biogeosciences, 13, 2823-2848, doi:10.5194/bg-13-2823-2016, 2016

Battaglia, M., L. Kleint, S. Krucker, D. Graham, How Important are Electron Beams in Driving Chromospheric Evaporation in the 2014 March 29 Flare? Astrophys. J., 813, 2015.

Blagoveshchensky, D., M. Sergeeva, Ionosphere dynamics in the auroral zone during the magnetic storm of March 17-18, 2015, J. Atmos. Sol. Terr. Phys., in press, 2016.

Blum, L.W., A. Halford, R. Millan, J.W. Bonnell, J. Goldstein, M. Usanova, M. Engebretson, M. Ohnsted, G. Reeves, H. Singer, et al., Observations of coincident EMIC wave activity and duskside energetic electron precipitation on 18–19 January 2013, Geophys. Res. Lett., 42, 5727-5735, 2015.

Carbary, J.F., W.S. Kurth, D.G. Mitchell, Short periodicities in low-frequency plasma waves at Saturn, J. Geophys. Res. Space Physics, 121, doi:10.1002/2016JA022732, 2016.

Cassak, P.A., Inside the Black Box: Magnetic Reconnection and the Magnetospheric Multiscale Mission, Space Weather, 14, 186–197, doi:10.1002/2015SW001313, 2016.

Chaston, C.C., Inverted-V Auroral Arcs and Alfven Waves, in Auroral Dynamics and Space Weather, Y. Zhang and L. Paxton (Eds.), AGU, Geophysical Monograph, 215, 2015.

Chen, C.H.K., L. Matteini, D. Burgess, T.S. Horbury, Magnetic field rotations in the solar wind at kinetic scales, MNRAS, 453, L64–L68, 2015.

Chen, C.H.K., L. Matteini, A. A. Schekochihin, M.L. Stevens, C.S. Salem, B.A. Maruca, M.W. Kunz, S.D. Bale, Multi-Species Measurements of the Firehose and Mirror Instability Thresholds in the Solar Wind, Astrophys. J. Lett., 825, 2, L26, 2016.

Cheng, Z.Y., D.C. Fernández-Remolar, M.R.M. Izawa, D.M. Applin, M. Chong Díaz, M.T. Fernandez-Sampedro, M. García-Villadangos, T. Huang, L. Xiao, V. Parro, Oxalate formation under the hyperarid conditions of the Atacama desert as a mineral marker to provide clues to the source of organic carbon on Mars, J. Geophys. Res. Biogeosci., 121, 1593-1604, doi:10.1002/2016JG003439, 2016.

Cnossen, I., M. Förster, North-south asymmetries in the polarthermosphere-ionosphere system: Solar cycle and seasonal influences, J. Geophys. Res. Space Physics, 121, 612-627, 2016.

Coppola, C.M., G. Mizzi, D. Bruno, et al., State-to-state vibrational kinetics of H_2 and H^+_2 in a post-shock cooling gas with primordial composition, MNRAS, 457, 4, 3732-3742, 2016.

Dai, L., C. Wang, S. Duan, Z. He, J.R. Wygant, J. Bonnell, C.A. Cattell, C. Kletzing, D.N. Baker, X. Li, D. Malaspina, J.B. Blake, J. Fennell, S.G. Claudepierre, D.L. Turner, K. Takahashi, H.O. Funsten, G.D. Reeves, H.E. Spence, V. Angelopoulos, K.-H. Glassmeier, X. Tao, L. Chen, S. Thaller, A. Breneman, X. Tang, The near-Earth injection of MeV electrons associated with intense dipolarization electric fields: Van Allen Probes observations, Geophys. Res. Lett., 42, doi:10.1002/2015GL064955, 2015.

Visitor Publications

Dalla, S., M.S. Marsh, T. Laitinen, Drift-induced deceleration of Solar Energetic Particles, Astrophys. J., 808, 1, 62, 2015.

Dargent, J., N. Aunai, G. Belmont, N. Dorville, B. Lavraud, M. Hesse, Full PIC simulations of kinetic equilibria and role of the initial current sheet on steady asymmetric magnetic reconnection, Phys. of Plasmas, 82, 3, doi:10.1017/S002237781600057X, 2016.

Deca, J., A. Divin, X. Wang, B. Lembège, S. Markidis, M. Horányi, G. Lapenta, Three-dimensional full-kinetic simulation of the solar wind interaction with a vertical dipolar lunar magnetic anomaly, Geophys. Res. Lett., 43, doi:10.1002/2016GL068535., 2016.

De Rosa, A., S. Bianchi, T. Bogdanovic, R. Decarli, R. Herrero-Illana, B. Husemann, S. Komossa, E. Kun, N. Loiseau, Z. Paragi, M. Perez-Torres, E. Piconcelli, K. Schawinski, C. Vignali, Multiple AGN in the crowded field of the compact group SDSSJ0959+1259, MNRAS, 453, 1, 214-221, 2015.

Dexter, J., A public code for general relativistic, polarised radiative transfer around spinning black holes, MNRAS, doi: 10.1093/mnras/stw1428, in press, 2016.

Doss, E., C.M. Komar, P.A. Cassak, F.D. Wilder, S. Eriksson, J.F. Drake, Asymmetric magnetic reconnection with a flow shear and applications to the magnetopause, J. Geophys. Res., 120, 7748, 2015.

Drake, J.F., M. Swisdak, M. Opher, A Model of the Heliosphere with Jets, Astrophys. J. Lett., 808, 2, L 44, 2015.

Dudík, J., S. Mackovjak, E. Dzifcaková, G. Del Zanna, D.R. Williams, M. Karlický, H.E. Mason, J. Löriník, P. Kotrc, F. Fárník, A. Zemanová, Imaging and Spectroscopic Observations of a Transient Coronal Loop: Evidence for the Non-Maxwellian K Distributions, Astrophys. J., 807, 2, 123, 19, 2015.

Dzifcáková, E., J. Dudík, Ionisation Equilibrium for the Non-Maxwellian Electron n-Distributions in Solar Flares: Updated Calculations, Sol. Phys., 290, 12, 3545-3558, 2015.

Dzifcáková, E., J. Dudík, Erratum to: Ionisation Equilibrium for the Non-Maxwellian Electron n-Distributions in Solar Flares: Updated Calculations, Sol. Phys., in press, 2016.

Dzifcáková, E., J. Dudík, P. Kotrc, F. Fárník, A. Zemanová, KAPPA: A Package for Synthesis of Optically Thin Spectra for the Non-Maxwellian κ-distributions Based on the Chianti Database, Astrophys. J. Suppl. Ser., 217, 1, 14, 2015.

Eleftheriou, A., C. Filizzola, N. Genzano, T. Lacava, M. Lisi, R. Paciello, N. Pergola, F. Vallianatos, V. Tramutoli., Long term RST analysis of anomalous TIR sequences in relation with earthquakes occurred in Greece in the period 2004-2013, Pure and Applied Geophys., 173, 1, 285-303, 2016.

Esposito, F., C.M. Coppola, D. De Fazio, Complementarity between Quantum and Classical Mechanics in Chemical Modeling. The H + HeH^+ H_2^+ + He Reaction: A Rigourous Test for Reaction Dynamics Methods, The Journal of Physical Chemistry A, 119, 51, 12615-12626, 2015.

Fang, X., C. Xia, R. Keppens, T. Van Doorsselaere, Coronal Rain in Magnetic Arcades: Rebound Shocks, Limit Cycles, and Shear Flows, Astrophys. J., 807, 2, 2015.

Fang, X., D. Yuan, T. Van Doorsselaere, R. Keppens, C. Xia, Modeling of reflective propagating slow-mode wave in a flaring loop, Astrophys. J., 813, 1, 33, 2015.

Ferrario, L., A. Melatos, J. Zrake, Magnetic Field Generation in Stars, Space Sci. Rev., 191, 77-109, 2015.

Fragile, P.C., O. Straub, O. Blaes, High-Frequency and Type-C QPOs from Oscillating, Precessing Hot, Thick Flow, MNRAS, in press, 2016.

Fraschetti F., Cross-field transport in Goldreich-Sridhar magnetohydrodynamic turbulence', Phys. Rev. E, 93, 013206, 2016.

Geiger, C., H.-R. Müller, J.P. Samluk, E.R. Bernstein, J. Richter-Menge, Impact of spatial aliasing on sea-ice thickness measurements, Ann. Glaciol., 56, 69, 2015.

Genzano N., C. Filizzola, R. Paciello, N. Pergola, Tramutoli V, Robust Satellite Techniques (RST) for monitoring Earthquake prone areas by satellite TIR observations: the case of 1999 Chi-Chi earthquake (Taiwan), Journal of Asian Earth Sciences, 114, 2, 289–298, 2015.

Gkioulidou, M., S. Ohtani, D.G. Mitchell, A. Ukhorskiy, G.D. Reeves, D.L. Turner, J.W. Gjerloev, M. Nosé, K. Koga, J.V. Rodriguez, L.J. Lanzerotti, Spatial structure and temporal evolution of energetic particle injections in the inner magnetosphere during the 14 July 2013 substorm event, J. Geophys. Res., 120, 1924-1938, 2015.

Gkioulidou, M., A.Y. Ukhorskiy, D.G. Mitchell, L.J. Lanzerotti, Storm time dynamics of ring current protons: Implications for the long-term energy budget in the inner magnetosphere, Geophys. Res. Lett., 43, 4736–4744, doi:10.1002/2016GL068013, 2016.

Gómez-Herrero, R., N. Dresing, A. Klassen, B. Heber, D. Lario, N. Agueda, O.E. Malandraki, J.J. Blanco, J. Rodríguez-Pacheco, S. Banjac, Circumsolar Energetic Particle Distribution on 2011 November 3, Astrophys. J., 799, 55, 2015.

Grießmeier, J.-M., F. Tabataba-Vakili, A. Stadelmann, J.L. Grenfell, D. Atri, Galactic cosmic rays on extrasolar Earth-like planets, II. Atmospheric implications, Astron. Astrophys., 587, A159, 2016.

Guo, Y., C. Xia, R. Keppens, G. Valori, Magneto-Frictional Modeling of Coronal Nonlinear Force-Free Fields: I. Testing with Analytic Solutions, Astronom. Astrophys., in press, 2016.

Haggerty, C.C., M.A. Shay, J.F. Drake, T.D. Phan, C.T. McHugh, The competition of electron and ion heating during magnetic reconnection, Geophys. Res. Lett., 42, doi:10.1002/2015GL065961, 2015.

Han, P., K. Hattori, G. Xu, R. Ashida, C-H. Chen, F. Febriani, H. Yamaguchi, H., Further investigations of geomagnetic diurnal variations associated with the 2011 off the Pacific coast of Tohoku earthquake (Mw 9.0), Journal of Asian Earth Sciences, 114, 2, 321–326, 2015.

He, H.-Q., Perpendicular Diffusion in the Transport of Solar Energetic Particles from Unconnected Sources: The Counter-streaming Particle Beams Revisited, Astrophys. J., 814, 157, 2015.

Hietala, H., J.F. Drake, T.D. Phan, J.P. Eastwood, J.P. McFadden, Ion temperature anisotropy across a magnetotail reconnection jet, Geophys. Res. Lett., 42, 18, 7239-7247, 2015.

Jiang, C., S.T. Wu, X. Feng, Q. Hu, Data-driven magnetohydrodynamic modelling of a flux-emerging active region leading to solar eruption, Nature Comm. 7, 11522, 2015.

Jiang, C., S.T. Wu, V. Yurchyshyn, H. Wang, X. Feng, Q. Hu, How did a major confined flare occur in super solar active region 12192?, Astrophys. J., in press, 2016.

Joachimi, B., Cacciato, M., Kitching, T.D. et al., Galaxy Alignments: An Overview, Space Sci. Rev., 193, 1, 2015.

Johnson, J.R., S. Wing, The dependence of the strength and thickness of field-aligned currents on solar wind and ionospheric parameters, J. Geophys. Res. Space Physics, 120, 3987-4008, 2015.

Kara, E., W. Alston, A. Fabian, A global look at X-ray time lags in Seyfert galaxies, Astron. Nachr., 337, 473-478, doi: 10.1002/asna.201612332, 2016.

Karlsson, T., E. Liljeblad, A. Kullen, J.M. Raines, J.A. Slavin, T. Sundberg, Isolated magnetic field structures in Mercury's magnetosheath as possible analogues for terrestrial magnetosheath plasmoids and jets, Planet. Space Sci., in press, 2016.

Kartavykh, Y.Y., W. Dröge, M. Gedalin, Simulation of Energetic Particle Transport and Acceleration at Shock Waves in a Focused Transport Model: Implications for Mixed Solar Particle Events, Astrophys. J., 820, 24, 2016.

Kaufman, J., O.M. Blaes, Bulk Comptonization by turbulence in accretion discs, MNRAS, 459, 2, 1790-1802, 2016.

Kepko, L., R.L. McPherron, O. Amm, S. Apatenkov, W. Baumjohann, J. Birn, M. Lester, R. Nakamura, T.I. Pulkkinen, V. Sergeev, Substorm Current Wedge Revisited, Space Sci. Rev., 190, 1-46, 2015.

Kiessling, A., M. Cacciato, B. Joachimi, et al., Galaxy Alignments: Theory, Modelling & Simulations, Space Sci. Rev., 193, 67, 2015.

Kilcik, A., V. Yurchyshyn, F. Clette, A. Ozguc, J.-P. Rozelot, Active Latitude Oscillations Observed on the Sun, Sol. Phys., 291, 4, 1077-1087, 2016.

Kirk, D., M.L. Brown, H. Hoekstra et al., Galaxy Alignments: Observations and Impact on Cosmology, 193, 139, 2015.

Kohutova, P., E. Verwichte, Analysis of Coronal Rain Observed by IRIS, HINODE/SOT and SDO/AIA: Transverse Oscillations, Kinematics and Thermal Evolution, Astrophys. J., in press, 2016.

Kunz, M.W., A.A. Schekochihin, C.H.K. Chen, I.G. Abel and S.C. Cowley, Inertial-range kinetic turbulence in pressure-anisotropic astrophysical plasmas, J. Plasma Phys., 81, 325810501, 2015.

Laitinen, T., A. Kopp, F. Effenberger, S. Dalla, M.S. Marsh, Solar energetic particle access to distant longitudes via turbulent field-line meandering, Astron. Astrophys., 591, A18, 2016.

Lam, M.M., B.A. Tinsley, Solar wind-atmospheric electricity-cloud microphysics connections to weather and climate, J. Atmos. Sol. Terr. Phys., in press, 2016.

Lario, D., R.B. Decker, E.C. Roelof, A.-F. Viñas, Energetic Particle Pressure at Interplanetary Shocks: STEREO-A Observations, Astrophys. J., 813, 85, 2015.

Lario, D., R.-Y. Kwon, A. Vourlidas, N.E. Raouafi, D.K. Haggerty, G.C. Ho, B.J. Anderson, A. Papaioannou, R. Gómez-Herrero, N. Dresing, P. Riley, Longitudinal Properties of a Widespread Solar Energetic Particle Event on 2014 February 25: Evolution of the Associated CME Shock, Astrophys. J., 819, 72, 2016.

Litt, S.K., A.I. Smolyakov, A.S. Bains, O.A. Pokhotelov, O.G. Onishchenko, W. Horton, Nonlinear Equation for Farley–Buneman Waves in Multispecies Plasma, Plasma Phys. Rep., 42, 5, 400-406, 2016.

Litt, S.K., A.S. Bains, A.I. Smolyakov, O.G. Onishchenko, O.A. Pokhotelov, Nonlinear spreading of Farley-Buneman waves, Phys. Plasmas, 22, 114501, 2015.

Lisi, M., C. Filizzola, N. Genzano, R. Paciello, N. Pergola, V. Tramutoli, Reducing atmospheric noise in RST analysis of TIR satellite radiances for earthquakes prone areas satellite monitoring. Physics and Chemistry of the Earth,

Visitor Publications

Physics and Chemistry of the Earth, Parts A/B/C, 85-86, 87-97, 2015.

Liu, J., V. Angelopoulos, X.-J. Zhang, D.L. Turner, C. Gabrielse, A. Runov, J. Bonnell, C.A. Kletzing, J.B. Blake, H.O. Funsten, D.N. Baker, H.E. Spence, Dipolarizing flux bundles in the cis-geosynchronous magnetosphere: Relationship between electric fields and energetic particle injections, J. Geophys. Res., 121, 2015.

Liu J.Y., Y.I. Chen, C.C. Huang, M. Parrot, X.H. Shen, S.A. Pulinets, Q.S. Yang, Y.Y. Ho, A spatial analysis on seismo-ionospheric anomalies observed by DEMETER during the 2008 M8.0 Wenchuan earthquake, Journal of Asian Earth Sciences, 114, 2, 414–419, 2015.

Luna, M., J. Terradas, E. Khomenko, M. Collados, A. de Vicente, On the Robustness of the Pendulum Model for Large-amplitude Longitudinal Oscillations in Prominences, Astrophys. J., 817, 2, 157, 2016.

Luna, M., A.J. Diaz, R. Oliver, J. Terradas, J. Karpen, The Effects of Magnetic-field geometry on Longitudinal Oscillations of Solar Prominences: Cross-sectional area variation for thin tubes, Astron. Astrophys., in press, 2016.

Luo, X., M. Zhang, M. Potgieter, X. Feng, N.V. Pogorelov, A Numerical Simulation of Cosmic-Ray Modulation Near the Heliopause, Astrophys. J., 808, 82, 2015.

Ma, X., P.A. Delamere, A. Otto, Plasma transport driven by the Rayleigh-Taylor instability, J. Geophys. Res. Space Phys., 121, doi:10.1002/2015JA022122, 2016.

Ma, X., A. Otto, P.A. Delamere, H. Zhang, Interaction between reconnection and Kelvin–Helmholtz at the high-latitude magnetopause, Adv. Space Res., 58, 2, 231-239, 2016.

Mackay, D.H., A.R. Yeates, F.-X. Bocquet, Impact of an L5 magnetograph on nonpotential solar global magnetic field modeling, Astrophys. J. 825, 131, 2016.

Makhmutov, V.S., G.A. Bazilevskaya, Y.I. Stozhkov, A.K. Svirzhevskaya, N.S. Svirzhevsky, Catalogue of electron precipitation events as observed in the long-duration cosmic ray balloon experiment, J. Atmos. Sol. Terr. Phys., in press, 2016.

Mallet, A., A.A. Schekochihin, B.D.G. Chandran, C.H.K. Chen, T.S. Horbury, R.T. Wicks, C.C. Greenan, Measures of Three-Dimensional Anisotropy and Intermittency in Strong Alfvenic Turbulence, MNRAS, 459, 2, 2130-2139, 2016.

Martínez-Gómez, D., R. Soler, J. Terradas, Onset of the Kelvin-Helmholtz instability in partially ionized magnetic flux tubes, Astron. Astrophys., 578, A104, 2015.

Matsukiyo, S., Y. Matsumoto, Electron Acceleration at a High Beta and Low Mach Number Rippled Shock, J. Physics: Conf. Ser., 642, 012017, 2015.

McCracken, K.G., J. Beer, The Annual Cosmic-Radiation Intensities 1391–2014; The Annual Heliospheric Magnetic Field Strengths 1391–1983, and Identification of Solar Cosmic-Ray Events in the Cosmogenic Record 1800–1983, Sol. Phys., 290, 3051, 2015.

Melet, A., B. Meyssignac, Explaining the spread in global mean thermosteric sea level rise in CMIP5 climate models, J. of Climate, 28, 24, 9918-9940, 2015.

Miyoshi, Y., S. Oyama, S. Saito, S. Kurita, H. Fujiwara, R. Kataoka, Y. Ebihara, C. Kletzing, G. Reeves, O. Santolik, M. Clilverd, C. J. Rodger, E. Turunen, F. Tsuchiya, Energetic electron precipitation associated with pulsating aurora: EISCAT and Van Allen Probe observations, J. Geophys. Res. Space Physics, 120, 2754-2766, 2015.

Moore, L., T. Stallard, M. Galand, Upper atmospheres of the giant planets, in Heliophysics: Active stars, their astrospheres, and impacts on planetary environments, C.J. Schrijver, F. Bagenal, and J.J. Sojka (eds.), Chapter 8, Cambridge University press, ISBN:9781316489123, 2015.

Nakariakov, V.M., V. Pilipenko, B. Heilig, P. Jelínek, M. Karlický, D.Y. Klimushkin, D.Y. Kolotkov, D.-H. Lee, G. Nisticò, T. Van Doorsselaere, G. Verth, I.V. Zimovets, Magnetohydrodynamic Oscillations in the Solar Corona and Earth's Magnetosphere: Towards Consolidated Understanding, Space Sci Rev, 200, 75-203, 2016.

Neilsen, J., F. Rahoui, J. Homan, M. Buxton, A Super-Eddington, Compton-Thick Wind In Gro J1655–40?, Astrophys. J., 822, 1, 2016.

Nordheim, T.A., G.H. Jones, J.S. Halekas, E. Roussos, A.J. Coates, Surface charging and electrostatic dust acceleration at the nucleus of comet 67P during periods of low activity, Planet. Space Sci., 119, 24-35, 2015.

Ohira, Y., Magnetic Field Amplification by Collisionless Shocks in Partially Ionized Plasmas, Astrophys. J., 817, 137, 2016.

Okamoto, T.J., P. Antolin , B. De Pontieu, H. Uitenbroek, T. Van Doorsselaere, T. Yokoyama, Resonant Absorption of Transverse Oscillations and Associated Heating in a Solar Prominence. I. Observational Aspects, Astrophys. J., 809, 71, 2015.

Oliver, R., R. Soler, J. Terradas, T.V. Zaqarashvili, Dynamics of Coronal Rain and Descending Plasma Blobs In Solar Prominences II. Partially Ionized Case, Astrophys. J., 818, 2, 2016.

Opher, M., J.F. Drake, B. Zieger, M. Swisdak, G. Toth, Magnetized Jets Driven by the Sun: The Structure of the Heliosphere Revisited – Updates, Physics of Plasmas, 23, 056501, 2016.

Opher, M., J.F. Drake, B. Zieger, T.I. Gombosi, I. Magnetized Jets Driven by the Sun: The Structure of the Heliosphere Revisited, Astrophys. J. Lett., 800, L28, 2015.

Owens, M.J., E. Cliver, K.G. McCracken, J. Beer, L. Barnard, M. Lockwood, A. Rouillard, D. Passos, P. Riley, I. Usoskin, Y-M. Wang, Near-Earth Heliospheric Magnetic Field Intensity since 1750. Part 1: Sunspot and Geomagnetic 1 Reconstructions, J. Geophys. Res. Space Physics, 121, doi:10.1002/2016JA022529, 2016.

Owens, M.J., E. Cliver, K.G. McCracken, J. Beer, L. Barnard, M. Lockwood, A. Rouillard, D. Passos, P. Riley, I. Usoskin, Y-M. Wang, Near-Earth heliospheric magnetic field intensity since 1750: 2. Cosmogenic radionuclide reconstructions, J. Geophys. Res. Space Physics, 121, doi:10.1002/2016JA022550, 2016.

Palmaerts, B., E. Roussos, N. Krupp, W.S. Kurth, D.G. Mitchell, J.N. Yates, Statistical analysis and multi-instrument overview of the quasi-periodic 1-hour pulsations in Saturn's outer magnetosphere, Icarus, 271, 1-18, 2016.

Papitto, A., D.F. Torres, A Propeller Model for the Sub-Luminous State of the Transitional Millisecond Pulsar PSR J1023+0038, Astrophys. J., 807, 1, 2015.

Paranicas, C., M.F. Thomsen, N. Achilleos, M. Andriopoulou, S.V. Badman, G. Hospodarsky, C.M. Jackman, X. Jia, T. Kennelly, K. Khurana, P. Kollmann, N. Krupp, P. Louarn, E. Roussos, N. Sergis, Effects of radial motion on interchange injections at Saturn, Icarus, 264, 342-351, 2016.

Pedatella, N.M., A. Maute, Impact of the semidiurnal lunar tide on the midlatitude thermospheric wind and ionosphere during sudden stratosphere warmings, J. Geophys. Res. Space Physics, 120, 10,740-10,753, doi:10.1002/2015JA021986, 2015.

Pedatella, N.M., T.-W. Fang, H. Jin, F. Sassi, H. Schmidt, J.L. Chau, T.A. Siddiqui, L. Goncharenko, Multi-model comparison of the ionosphere variability during the 2009 sudden stratosphere warming, J. Geophys. Res. Space Physics, in press, 2016.

Perri, S., G. Zimbardo, Short Acceleration Times from Superdiffusive Shock Acceleration in the Heliosphere, Astrophys. J., 815, 75, 2015.

Perri, S., G. Zimbardo, Evidence for superdiffusive shock acceleration at interplanetary shock waves, J. Phys. Conf. Ser., 642, id. 012020, doi: 10.1088/1742-6596/642/1/012020, 2015.

Perry, G.W., H. Dahlgren, M.J. Nicolls, M. Zettergren, J.-P. St.-Maurice, J.L. Semeter, T. Sundberg, K. Hosokawa, K. Shiokawa, S. Chen, Spatiotemporally resolved electrodynamic properties of a Sun-aligned arc over Resolute Bay, J. Geophys. Res. Space Physics, 120, 9977-9987, doi:10.1002/2015JA021790, 2015.

Phan, T.D., M.A. Shay, J.P. Eastwood, V. Angelopoulos, M. Oieroset, M. Oka, M. Fujimoto, Establishing the Context for Reconnection Diffusion Region Encounters and Strategies for the Capture and Transmission of Diffusion Region Burst Data by MMS, Space Sci. Rev., 199, 631-650, 2015.

Pirani S., D. Turrini, Asteroid 4 Vesta: Dynamical and collisional evolution during the Late Heavy Bombardment, Icarus, 270, 170-179, 2016.

Plaschke, F., H. Hietala, V. Angelopoulos, R. Nakamura, Geoeffective jets impacting the magnetopause are very common, J. Geophys. Res. Space Physics, 121, 3240-3253, 2016.

Phillips, K.J.H., B. Sylwester, J. Sylwester, The X-Ray Line Feature at 3.5 KeV in Galaxy Cluster Spectra, Astrophys. J., 809, 1, 50, 2015.

Prikryl, P., K. Iwao, D. Muldrew, V. Rusin, M. Rybansky, and R. Bruntz, A link between high-speed solar wind streams and explosive extratropical cyclones, J. Atmos. Sol.-Terr. Phys., in press, 2016.

Pucci, F., F. Malara, S. Perri, G. Zimbardo, L. Sorriso-Valvo, F. Valentini, Energetic particle transport in the presence of magnetic turbulence: influence of spectral extension and intermittency, MNRAS, 459, 3395-3406, 2016.

Pulinets S.A., D.P. Ouzounov, A.V. Karelin, D.V., Davidenko, Physical Bases of the Generation of Short-Term Earthquake Precursors: A Complex Model of Ionization-Induced Geophysical Processes in the Lithosphere–Atmosphere–Ionosphere–Magnetosphere System, Geomagnetism and Aeronomy, 55, 4, 540-558, 2015.

Ray, L.C., N.A. Achilleos, J.N. Yates, The effect of including field-aligned potentials in the coupling between Jupiter's thermosphere, ionosphere, and magnetosphere, J. Geophys. Res., 120, 8, doi:10.1002/2015JA021319, 2015.

Reep, J.W., A.J.B. Russell, Alfvénic Wave Heating of the Upper Chromosphere in flares, Astrophys. J. Lett., 818, 1, 2016.

Reeves, G.D., R.H.W. Friedel, B.A. Larsen, R.M. Skoug, H.O. Funsten, S.G. Claudepierre, J.F. Fennell, D.L. Turner, M.H. Denton, H.E. Spence, et al., Energy-dependent dynamics of keV to MeV electrons in the inner zone, outer zone, and slot regions, J. Geophys. Res. Space Physics, 121, 397-412, doi:10.1002/2015JA021569, 2016.

Visitor Publications

Ripoll, J.-F., G.D. Reeves, G. Cunningham, V. Loridan, M. Denton, O. Santolik, W.S. Kurth, C.A. Kletzing, D.L. Turner, J.F. Fennell, Simulating the energy dependent structure of Earth's electron radiation belts during quiet recovery times, Geophys. Res. Lett., 43, doi:10.1002/2016GL068869, 2016.

Roussos, E., N. Krupp, D.G. Mitchell, C. Paranicas, S.M. Krimigis, M. Andriopoulou, B. Palmaerts, W.S. Kurth, S.V. Badman, A. Masters, M.K. Dougherty, Quasi-periodic injections of relativistic electrons in Saturn's outer magnetosphere, Icarus, 263, 101-116, 2015.

Roy, I., T. Asikainen, V. Maliniemi, K.Mursula, Comparing the influence of sunspot activity and activity on winter surface climate, J. Atmos. Sol.-Terr. Phys., in press, 2016.

Rozelot, J.P., A. Kosovichev, A. Kilcik, Solar Radius Variations: An Inquisitive Wavelength Dependence, Astrophys. J., 812, 2, 2015.

Ruderman, M., M. Luna. Damping of prominence longitudinal oscillations due to mass accretion, Astron. Astrophys., in press, 2016.

Sadowski, A., Thin accretion discs are stabilized by a strong magnetic field, MNRAS, 459, 4, 4397-4407, 2016.

Sakai, S., S. Watanabe, Plasma dynamics in Saturn's middle-latitude ionosphere and implications for magnetosphere-ionosphere coupling, Icarus, in press, 2016.

Samluk, J.P., C.A. Geiger, C.J. Weiss, Full-physics 3-D heterogeneous simulations of electromagnetic induction fields on level and deformed sea ice, Ann. Glaciol., 56, 69, 405, 2016.

Schanz, A., K. Hocke, N. Kaempfer, On forced and free atmospheric oscillations near the 27-day periodicity, Earth Planets and Space, 68-97, doi: 10.1186/s40623-016-0460-y, 2016.

Scheffler, G., M. Pulido, Compensation between Resolved and Unresolved Wave Drag in the Stratospheric Final Warmings of the Southern Hemisphere, J. Atmos. Sci., 72, 4393-4411, 2015.

Schwartz, J.C., C. Sekowski, H.M. Haggard, E. Pallé, N.B. Cowan, Inferring planetary obliquity using rotational and orbital photometry, MNRAS, 457, 1, 926-938, 2016.

Siddiqui, T.A., C. Stolle, H. Lühr, J. Matzka, On the relationship between weakening of the northern polar vortex and the lunar tidal amplification in the equatorial electrojet, J. Geophys. Res. Space Physics, 120, 10,006–10,019, 2015.

Soler, R., M. Carbonell, J.L. Ballester, On the spatial scales of wave heating in the solar chromosphere, Astrophys. J., 810, 146, 2015.

Sonnerup, B.U.O., G. Paschmann, S. Haaland, T. Phan, S. Eriksson, Reconnection layer bounded by switch-off shocks: Dayside magnetopause crossing by THEMIS D, J. Geophys. Res. Space Physics, 121, 3310-3332, 2016.

Soria, R., A. Kong, Revisiting the ultraluminous supersoft source in M 101: an optically thick outflow model, MNRAS, 456, 2, 1837-1858, 2016.

Southwood, D.J., E. Chané, High-latitude circulation in giant planet magnetospheres, J. Geophys. Res. Space Physics, 121, doi:10.1002/2015JA022310, 2016.

Steinacher, M, F. Joos, Transient Earth system responses to cumulative carbon dioxide emissions: linearities, uncertainties, and probabilities in an observation-constrained model ensemble, Biogeosciences, 13, 1071-1103, doi:10.5194/bg-13-1071-2016, 2016.

Straus, T., B. Fleck, V. Andretta, A Steady-state Supersonic Downflow in the Transition Region above a Sunspot Umbra, Astron. Astrophys., 582, A116, 2015.

Sugimura, K., C.M. Coppola, K. Omukai, D. Galli, F. Palla, Role of the H^+_2 channel in the primordial star formation under strong radiation field and the critical intensity for the supermassive star formation, MNRAS, 456, 270-277, 2016.

Sundberg, T., C.T. Haynes, D. Burgess, C.X. Mazelle, Ion Acceleration at the quasi-parallel Bow Shock: Decoding the signature of injection, Astrophys. J., 820, 1, 2016.

Tao, C., T. Kimura, S.V. Badman, N. André, F. Tsuchiya, G. Murakami, K. Yoshioka, I. Yoshikawa, A. Yamazaki, M. Fujimoto, Variation of Jupiter´s Aurora observed by Hisaki/EXCEED: 2. Estimations of auroral parameters and magnetospheric dynamics, J. Geophys. Res. Space Physics, 120, 2015.

Temerin, M., X. Li, The Dst index underestimates the solar cycle variation of geomagnetic activity, J. Geophys. Res. Space Physics, 120, 5603-5607, doi:10.1002/2015JA021467, 2015.

Terradas, J., R. Soler, M. Luna, R. Oliver, J.Ballester, A.N. Wright, Solar Prominences Embedded in Flux Ropes: Morphological Features and Dynamics from 3D MHD Simulations, Astrophys. J., 820, 2, 125, 2016.

Testa, P., B. Pontieu, V. Hansteen, High spatial resolution FeXII observations of solar active region, Astrophys. J., in press, 2016.

Tian, H., Z. Xu, J. He, C. Madsen, Are Iris Bombs Connected to Ellerman Bombs?, Astrophys. J., 824, 2, 2016.

Turrini, D., V. Svetsov, G.J. Consolmagno, S. Sirono, S. Pirani, Olivine on Vesta as exogenous contaminants brought by impacts: Constraints from modeling Vesta's collisional history and from impact simulations, Icarus, in press, 2016.

Turner, D. L., T.P. O'Brien, J.F. Fennell, S.G. Claudepierre, J.B. Blake, E.K.J. Kilpua, H. Hietala, The effects of geomagnetic storms on electrons in Earth's radiation belts, Geophys. Res. Lett., 42, 9176–9184, doi:10.1002/2015GL064747, 2015.

Tramutoli, V., R. Corrado, C. Filizzola, N. Genzano, M. Lisi, N. Pergola, From Visual Comparison to Robust Satellite Techniques: 30 Years of Thermal Infrared Satellite Data Analysis For The Study Of Earthquakes Preparation Phases, Bollettino di Geofisica Teorica e Applicata, 56, 2, 167-202, 2015.

Tramutoli, V., R. Corrado, C. Filizzola, N. Genzano, M. Lisi, R. Paciello, N. Pergola, One Year of RST Based Satellite Thermal Monitoring Over Two Italian Seismic Areas, Bollettino di Geofisica Teorica e Applicata, 56, 2, 275-294, 2015.

Treumann, R.A., W. Baumjohann, Spontaneous magnetic reconnection, Collisionless reconnection and its potential astrophysical relevance, Astron. Astrophys. Rev., 23, 4, 2015.

Urquhart, R., R. Soria, Optically thick outflows in ultraluminous supersoft sources, MNRAS, 456, 2, 1859-1880, 2016.

Van Doorsselaere T., P. Antolin, D. Yuan, V. Reznikova, N. Magyar, Forward Modeling of EUV and Gyrosynchrotron Emission from Coronal Plasmas with FoMo, Front. Astron. Space Sci., 3, 4, 2016.

Van Doorsselaere, T., E. Kupriyanova, D. Yuan, Quasi-periodic pulsations in solar and stellar flares: an overview of recent results, Sol. Phys., in press, 2016.

Vashalomidze Z., V. Kukhianidze, T.V. Zaqarashvili, R. Oliver, B. Shergelashvili, G. Ramishvili, S. Poedts, P. De Causmaecker, Formation and evolution of coronal rain observed by SDO/AIA on February 22, 2012, Astron. Astrophys., 577, A136, 2015.

Veretenenko, S., M. Ogurtsov, Cloud cover anomalies at middle latitudes: links to troposphere dynamics and solar variability, J. Atmos. Sol.-Terr. Phys., in press, 2016.

Wang, X., C. Tu, J. He, E. Marsch, L. Wang, C. Salem, The Spectral Features of Low-Amplitude Magnetic Fluctuations in the Solar Wind and Their Comparison With Moderate-Amplitude Fluctuations, Astrophys. J. Lett., 810, 2, 2015.

Wedemeyer, S., Bastian, T., Brajša, R. et al., Solar Science with the Atacama Large Millimeter/Submillimeter Array—A New View of Our Sun, Space Sci. Rev., 200, 1, 2016.

Wedemeyer, S., T. Bastian, R. Brajša et al., SSALMON – The Solar Simulations for the Atacama Large Millimeter Observatory Network, Adv. Space Res., 56, 12, 2679-2692, 2015.

Wing, S., J.R. Johnson, Theory and observations of upward field-aligned currents at the magnetopause boundary layer, Geophys. Res. Lett., 42, 9149-9155, doi:10.1002/2015GL065464, 2015.

Yamazaki, R., A. Loeb, Optical inverse-Compton emission from clusters of galaxies, MNRAS, 453, 1990-1998, 2015.

Yan, L., J. He, L. Zhang, C. Tu, E. Marsch, C.H.K. Chen, X. Wang, L. Wang, R. Wicks, Spectral Anisotropy of Elsasser Variables in Two Dimensional Wave-vector Space as Observed in the Fast Solar Wind Turbulence, Astrophys. J. Lett., 816, 2, 2016.

Wang, X., J. Schwan, H.-W. Hsu, E. Grün, M. Horányi, Dust charging and transport on airless planetary bodies, Geophys. Res. Lett., 43, 6103-6110, doi:10.1002/2016GL069491, 2016.

Weinzierl, M., D.H. Mackay, A.R. Yeates, A.A. Pevtsov, The possible impact of L5 magnetograms on non-potential solar coronal magnetic field simulations, Astrophys. J., in press, 2016.

Yang, L., L. Zhang, J. He, C. Tu, L. Wang, E. Marsch, X. Wang, S. Zhang, X. Feng, The Formation of Rotational Discontinuities in Compressive Three-Dimensional MHD Turbulence, Astrophys. J., 809, 155, 2015.

Zimbardo, G., E. Amato, A. Bovet, F. Effenberger, A. Fasoli, H. Fichtner, I. Furno, K. Gustafson, P. Ricci, S. Perri, Superdiffusive transport in laboratory and astrophysical plasmas, J. Plasma Physics, 81, 495810601, 2015.

Zhou, L., B.A. Tinsley, H. Chu, Z. Xiao, Correlations of global sea surface temperatures with the solar wind speed, J. Atmos. Sol.-Terr. Phys., in press, 2016.

Zurbuchen, T.H., D.J. Gershman, Innovations in plasma sensors, J. Geophys. Res. Space Physics, 121, 2891-2901, 2016.

Visitor Publications

Special Issue

25 Years of Self-Organized Criticality

in Space Science Reviews

Guest Editor:
Markus J. Aschwanden

Volume 198, 1-4, January 2016

Table of Contents

Published Volumes

These volumes may be ordered directly from Springer or for a substantially reduced price through ISSI. If you are interested in buying our books, please contact secretary@issibern.ch. More information is provided on the websites www.issibern.ch (go to 'Publications') or www.springer.com.

Volume 1: The Heliosphere in the Local Interstellar Medium
R. von Steiger, R. Lallement, and M.A. Lee (eds.), ISSI-Workshop held in November 1995, published in October 1996. Reprinted from Space Science Reviews, Vol. 78, No. 1-2, 1996. ISBN 0-7923-4320-4.

Volume 2: Transport Across the Boundaries of the Magnetosphere
B. Hultqvist, and M. Øieroset (eds.), ISSI-Workshop held in October 1996, published in October 1997. Reprinted from Space Science Reviews, Vol. 80, No. 1-2, 1997. ISBN 0-7923-4788-9. This volume is out of print.

Volume 3: Cosmic Rays in the Heliosphere
L.A. Fisk, J.R. Jokipii, G.M. Simnett, R. von Steiger, and K.-P. Wenzel (eds.), two ISSI-Workshops held in September 1996, March 1997 respectively, published in May 1998. Reprinted from Space Science Reviews, Vol. 83, No. 1-2, 1998. ISBN 0-7923-5069-3.

Volume 4: Primordial Nuclei and Their Galactic Evolution
N. Prantzos, M. Tosi, and R. von Steiger (eds.), ISSI-Workshop held in May 1997, published in August 1998. Reprinted from Space Science Reviews, Vol. 84, No. 1-2, 1998. ISBN 0-7923-5114-2.

Volume 5: Solar Composition and its Evolution — From Core to Corona
C. Fröhlich, M.C.E. Huber, S.K. Solanki, and R. von Steiger (eds.), ISSI-Workshop held in January 1998, published in December 1998. Reprinted from Space Science Reviews, Vol. 85, No. 1-2, 1998. ISBN 0-7923-5496-6.

Volume 6: Magnetospheric Plasma Sources and Losses
B. Hultqvist, M. Øieroset, G. Paschmann, and R. Treumann (eds.), ISSI-Workshop held in October 1997, published in September 1999. Reprinted from Space Science Reviews, Vol. 88, No. 1-2, 1999. ISBN 0-7923-5828-7.

Volume 7: Corotating Interaction Regions
A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow (eds.), ISSI-Workshop held in June 1998, published in January 2000. Reprinted from Space Science Reviews, Vol. 89, No. 1-2, 1999. ISBN 0-7923-6080-3.

Volume 8: Composition and Origin of Cometary Materials
K. Altwegg, P. Ehrenfreund, J. Geiss, and W.F. Huebner (eds.), ISSI-Workshop held in September 1998, published in January 2000. Reprinted from Space Science Reviews, Vol. 90, No. 1-2, 1999. ISBN 0-7923-6154-7.

Volume 9: From Dust to Terrestrial Planets
W. Benz, R. Kallenbach, and G. Lugmair (eds.), ISSI-Workshop held in February 1999, published in October 2000. Reprinted from Space Science Reviews, Vol. 92, No. 1-2, 2000. ISBN 0-7923-6467-8.

Volume 10: Cosmic Rays and Earth
J.W. Bieber, E. Eroshenko, P. Evenson, E.O. Flückiger, and R. Kallenbach (eds.), ISSI-Workshop held in March 1999, published in December 2000. Reprinted from Space Science Reviews, Vol. 93, No. 1-2, 2000. ISBN 0-7923-6712-X.

Volume 11: Solar Variability and Climate
E. Friis-Christensen, C. Fröhlich, J.D. Haigh, M. Schüssler, and R. von Steiger (eds.), ISSI-Workshop held in June 1999, published in December 2000. Reprinted from Space Science Reviews, Vol. 94, No. 1-2, 2000. ISBN 0-7923-6741-3.

Volume 12: Chronology and Evolution of Mars
R. Kallenbach, J. Geiss and W.K. Hartmann (eds.), ISSI-Workshop held in April 2000, published in September 2001. Reprinted from Space Science Reviews, Vol. 96, No. 1-4, 2001. ISBN 0-7923-7051-1.

Space Sciences Series of ISSI (SSSI)

Volume 13: The Astrophysics of Galactic Cosmic Rays
R. Diehl, E. Parizot, R. Kallenbach, and R. von Steiger (eds.), two ISSI-Workshops held in October 1999, May 2000 respectively, published in February 2002. Reprinted from Space Science Reviews, Vol. 99, No. 1-4, 2001. ISBN 1-4020-0107-9.

Volume 14: Matter in the Universe
Ph. Jetzer, K. Pretzl, and R. von Steiger (eds.), ISSI-Workshop held in March 2001, published in June 2002. Reprinted from Space Science Reviews, Vol. 100, No. 1-4, 2002. ISBN 1-4020-0666-7.

Volume 15: Auroral Plasma Physics
G. Paschmann, S. Haaland, and R. Treumann (eds.), three ISSI-Workshops held in October 1999, March and December 2000, published in April 2003, 2nd edition in April 2005. Reprinted from Space Science Reviews, Vol. 103, No. 1-4, 2002. ISBN 1-4020-0963-1.

Volume 16: Solar System History from Isotopic Signatures of Volatile Elements
R. Kallenbach, T. Encrenaz, J. Geiss, K. Mauersberger, T. Owen, and F. Robert (eds.), ISSI-Workshop held in January 2002, published in July 2003. Reprinted from Space Science Reviews, Vol. 106, No. 1-4, 2003. ISBN 1-4020-1177-6.

Volume 17: Earth Gravity Field from Space — From Sensors to Earth Sciences
G. Beutler, R. Rummel, M.R. Drinkwater, and R. von Steiger (eds.), ISSI-Workshop held in March 2002, published in November 2003. Reprinted from Space Science Reviews, Vol. 108, No. 1-2, 2003. ISBN 1-4020-1408-2.

Volume 18: Mars' Magnetism and its Interaction with the Solar Wind
D. Winterhalter, M. Acuña, and A. Zakharov (eds.), ISSI-Workshop held in October 2001, published in June 2004. Reprinted from Space Science Reviews, Vol. 111, No. 1-2, 2004. ISBN 1-4020-2048-1.

Volume 19: The Outer Planets and their Moons
T. Encrenaz, R. Kallenbach, T. Owen, and C. Sotin (eds.), ISSI-Workshop held in January 2004, published in June 2005. Reprinted from Space Science Reviews, Vol. 116, No. 1-2, 2005. ISBN 1-4020-3362-1.

Volume 20: Outer Magnetospheric Boundaries: Cluster Results
G. Paschmann, S. Schwartz, C.P. Escoubet, S. Haaland (eds.), two ISSI-Workshops held in March and November 2003, published in June 2005. Reprinted from Space Science Reviews, Vol. 118, No. 1-4, 2005. ISBN 1-4020-3488-1, ISSI price Euro 65.40.

Volume 21: Coronal Mass Ejections
H. Kunow, N. Crooker, J. Linker, R. Schwenn, and R. von Steiger (eds.), ISSI-Workshop held in March 2004, published in 2006. Reprinted from Space Science Reviews, Vol. 123, No. 1-3, 2006. ISBN 978-0-387-45086-5, ISSI price Euro 83.97.

Volume 22: Solar Dynamics and its Effects on the Heliosphere and Earth
D. Baker, B. Klecker, S. Schwartz, R. Schwenn, and R. von Steiger (eds.), ISSI-Workshop held in April 2005, published in 2007. Reprinted from Space Science Reviews, Vol. 124, No. 1-4, 2006. ISBN 978-0-387-69531-0.

Volume 23: Solar Variability and Planetary Climates
Y. Calisesi, R.-M. Bonnet, L. Gray, J. Langen, and M. Lockwood (eds.), ISSI-Workshop held in June 2005, published in 2007. Reprinted from Space Science Reviews, Vol. 125, No. 1-4, 2006. ISBN 978-0-387-48339-9.

Volume 24: Geology and Habitability of Terrestrial Planets
K.E. Fishbaugh, P. Lognonné, F. Raulin, D. des Marais, and O. Korablev (eds.), ISSI-Workshop held in September 2005, published in September 2007. Reprinted from Space Science Reviews, Vol. 129, No. 1-3, 2007. ISBN 978-0-387-74287-8.

Volume 25: Strategies for Life Detection
O. Botta, J.L. Bada, J. Gomez-Elvira, E. Javaux, F. Selsis, and R. Summons (eds.), ISSI-Workshop held in April 2006, published in August 2008. Reprinted from Space Science Reviews, Vol. 135, No. 1-4, 2008. ISBN 978-0-387-77515-9.

Volume 26: Mercury
A. Balogh, L. Ksanfomality, and R. von Steiger (eds.), ISSI-Workshop held in June 2006, published in May 2008. Reprinted from Space Science Reviews, Vol. 132, No. 2-4, 2007. ISBN 978-0-387-77538-8.

Volume 27: The Composition of Matter - Symposium honouring Johannes Geiss on the occasion of his 80th birthday
R. von Steiger, G. Gloeckler, and G.M. Mason (eds.), ISSI-Workshop held in September 2006, published in November 2007. Reprinted from Space Science Reviews, Vol. 130, No. 1-4, 2007. ISBN 978-0-387-74183-3.

Volume 28: Origin and Early Evolution of Comet Nuclei
H. Balsiger, K. Altwegg, W. Huebner, T. Owen, and R. Schulz (eds.), ISSI-Workshop held in October 2006, published in October 2008. Reprinted from Space Science Reviews, Vol. 138, No. 1-4, 2008. ISBN 978-0-387-85454-0.

Volume 29: Comparative Aeronomy
A.F. Nagy, A. Balogh, T.E. Cravens, M. Mendillo, and I. Müller-Wodarg (eds.), ISSI-Workshop held in June 2007, published in January 2009. Reprinted from Space Science Reviews, Vol. 139, No. 1-4, 2008. ISBN 978-0-387-87824-9.

Volume 30: Planetary Atmospheric Electricity
F. Leblanc, K. Aplin, Y. Yair, G. Harrison, J.P. Lebreton, and M. Blanc (eds.), ISSI- and Europlanet-Workshop held in July 2007, published in October 2008. Reprinted from Space Science Reviews, Vol. 137, No. 1-4, 2008. ISBN 978-0-387-87663-4.

Volume 31: From the Outer Heliosphere to the Local Bubble
J. Linsky, E. Möbius, V.V. Izmodenov, and R. von Steiger (eds.), ISSI-Workshop held in October 2007, published in May 2009. Reprinted from Space Science Reviews, Vol. 143, No. 1-4, 2009. ISBN 978-1-4419-0246-7.

Volume 32: The Origin and Dynamics of Solar Magnetism
M.J. Thompson, A. Balogh, J.L. Culhane, A. Nordlund, S.K. Solanki, and J.-P. Zahn (eds.), ISSI-Workshop held in January 2008, published in May 2009. Reprinted from Space Science Reviews, Vol. 144, No. 1-4, 2009. ISBN 978-1-4419-0238-2.

Volume 33: Planetary Magnetism
U.R. Christensen, A. Balogh, D. Breuer, and K.-H. Glassmeier (eds.), ISSI-Workshop held in September 2008, published in October 2010. Reprinted from Space Science Reviews, Vol. 152, No.1-4, 2010. ISBN 978-1-4419-5900-3.

Volume 34: Probing the Nature of Gravity – Confronting Theory and Experiment in Space
C.W.F. Everitt, M.C.E. Huber, R. Kallenbach, G. Schäfer, B.F. Schutz, and R.A. Treumann (eds.), ISSI-Workshop held in October 2008, published in June 2010. Reprinted from Space Science Reviews, Vol. 148, No. 1-4, 2009. ISBN 978-1-4419-1361-6.

Volume 35: Satellites of the Outer Solar System – Exchange Processes Involving the Interiors
O. Grasset, M. Blanc, A. Coustenis, W.B. Durham, H. Hussmann, R. Pappalardo, and D. Turrini (eds.), ISSI- and Europlanet-Workshop held in November 2008, published in December 2010. Reprinted from Space Science Reviews, Vol. 153, No. 1-4, 2010. ISBN 978-1-4419-7438-9.

Volume 36: Terrestrial Magnetism
G. Hulot, A. Balogh, U.R. Christensen, C. Constable, M. Mandea, and N. Olsen (eds.), ISSI-Workshop held in March 2009, published in January 2011. Reprinted from Space Science Reviews, Vol. 155, No. 1-4, 2010. ISBN 978-1-4419-7954-4.

Volume 37: The Plasma Environment of Venus, Mars, and Titan
K. Szego (eds.), ISSI- and Europlanet Workshop held in November 2009, published in February 2012. Reprinted from Space Science Reviews, Vol. 162, No. 1-4, 2011. ISBN 978-1-4614-3289-0.

Volume 38: Multiscale Physics in Coronal Heating and Solar Wind Acceleration
D. Burgess, J. Drake, E. Marsch, M. Velli, R. von Steiger, and T.H. Zurbuchen (eds.), ISSI-Workshop held in January 2010, published in January 2013. Reprinted from Space Science Reviews, Vol. 172, No. 1-4, 2012. ISBN 978-1-4614-6460-0.

Space Sciences Series of ISSI (SSSI)

Volume 39: Large-Scale Magnetic Fields in the Universe
R. Beck, A. Balogh, A. Bykov, R.A. Treumann, L. Widrow (eds.), ISSI-Workshop held in March 2010, to be published in January 2013. Reprinted from Space Science Reviews Vol. 166, No. 1-4, and Vol. 169, No. 1-4, 2012. ISBN 978-1-4614-5727-5.

Volume 40: The Earth's Cryosphere and Sea Level Change
L. Bengtsson, S. Koumoutsaris, R.-M. Bonnet, E.-A. Herland, P. Huybrechts, O.M. Johannessen, G. Milne, J. Oerlemans, A. Ohmura, G. Ramstein, P. Woodworth (eds.), ISSI-Workshop held in March 2010, published in October 2011. Reprinted from Surveys in Geophysics, Vol. 32, No. 4-5, 2011. ISBN 978-94-007-2062-6.

Volume 41: Observing and Modeling Earth's Energy Flows
L. Bengtsson, S. Koumoutsaris, R.-M. Bonnet, R.P. Allan, C. Fröhlich, J. Heintzenberg, P. Ingmann, R. Kandel, N.G. Loeb, B. Soden, K.E. Trenberth (eds.), ISSI-Workshop held in January 2011, published in September 2012. Reprinted from Surveys in Geophysics, Vol. 33, No. 3-4, 2012. ISBN 978-94-007-4326-7.

Volume 42: Dynamic Coupling between Earth's Atmospheric and Plasma Environments
T. Bösinger, J. LaBelle, H.J. Opgenoorth, J.-P. Pommereau, K. Shiokawa, S.C. Solomon, and R.A. Treumann (eds.), ISSI-Workshop held in September 2010, published in January 2013. Reprinted from Space Science Reviews Vol. 168, No. 1-4, 2012. ISBN 978-1-4614-5676-6.

Volume 43: Cosmic Rays in the Heliosphere – Temporal and Spatial Variations
B. Heber, J. Kóta, and R. von Steiger (eds.), ISSI-Workshop held in April 2010, published in September 2013. Reprinted from Space Science Reviews Vol. 176, No. 1-4, 2013. ISBN 978-1-4614-9199-6.

Volume 44: Quantifying the Martian Geochemical Reservoirs
M. Toplis, J. Bell III, E. Chassefière, C. Sotin, T. Spohn, and M. Blanc (eds.), ISSI- and Europlanet Workshop held in April 2011, published in June 2013. Reprinted from Space Science Reviews Vol. 174, No. 1-4, 2013. ISBN 978-1-4614-7773-0.

Volume 45: Particle Acceleration in Cosmic Plasmas
A. Balogh, A. Bykov, R.P. Lin, J. Raymond, and M. Scholer (eds.), ISSI-Workshop held in May 2011, published in January 2013. Reprinted from Space Science Reviews Vol. 173, No. 1-4, 2012. ISBN 978-1-4614-6454-9.

Volume 46: The Earth's Hydrological Cycle
L. Bengtsson, R.-M. Bonnet, M. Calisto, G. Destouni, R. Gurney, J. Johannessen, Y. Kerr, W.A. Lahoz, and M. Rast (eds.), ISSI-Workshop held in February 2012, published in July 2014. Reprinted from Surveys in Geophysics, Vol. 35, No. 3, 2014. ISBN 978-94-017-8788-8.

Volume 47: Microphysics of Cosmic Plasmas
A. Balogh, A. Bykov, P. Cargill, R. Dendy, T. Dudok de Wit, and J. Raymond (eds.), ISSI-Workshop held in April 2012, published in February 2014. Reprinted from Space Science Reviews Vol. 178, No. 2-4, 2013. ISBN 978-1-4899-7412-9.

Volume 48: Helioseismology and Dynamics of the Solar Interior
M.J. Thompson, A.S. Brun, J.L. Culhane, L. Gizon, M. Roth, and T. Sekii (eds.), ISSI-Workshop held in September 2012, published in 2016. Reprinted from Space Science Reviews Vol. 196, No. 1-4, 2015.

Volume 49: The Physics of Accretion onto Black Holes
M. Falanga, T. Belloni, P. Casella, M. Gilfanov, P. Jonker, and A. Kings (eds.), ISSI-Workshop held in October 2012, published in October 2014. Reprinted from Space Science Reviews Vol. 183, No. 1-4, 2014. ISBN 978-1-4939-2226-0.

Volume 50: Giant Planet Magnetodiscs and Aurorae
K. Szego, N. Achilleos, C. Arridge, S.V. Badman, P. Delamere, D. Grodent, M.G. Kivelson, and P. Louarn (eds.), ISSI- and Europlanet Workshop held in November 2012, published in September 2015. Reprinted from Space Science Reviews Vol. 187, No. 1-4, 2015. ISBN 978-1-4939-3394-5.

Volume 51: Multi-Scale Structure Formation and Dynamics in Cosmic Plasmas
A. Balogh, A. Bykov, J.P. Eastwood, and J.S. Kaastra (eds.), ISSI-Workshop held in April 2013, published in 2015. Reprinted from Space Science Reviews Vol. 188, No. 1-4, 2015. ISBN 978-1-4939-3546-8.

Volume 52: Plasma Sources of Solar System Magnetospheres
A.F. Nagy, M. Blanc, C. Chappell, and N. Krupp (eds.), ISSI Workshop held in September 2013, published in February 2016. Reprinted from Space Science Reviews Vol. 192, 1-4, 2015. ISBN 978-1-4939-3543-7.

Volume 53: The Solar Activity Cycle – Physical Causes and Consequences
A. Balogh, H. Hudson, K. Petrovay, R. von Steiger (eds.), ISSI Workshop held in November 2013, published in April 2015. Reprinted from Space Science Reviews Vol. 186, 1-4, 2014. ISBN 978-1-4939-2583-4.

Volume 54: The Strongest Magnetic Fields in the Universe
V.S. Beskin, A. Balogh, M. Falanga, M. Lyutikov, S. Mereghetti, T. Piran, and R.A. Treumann (eds.), ISSI Workshop held in February 2014, published in March 2016. Reprinted from Space Science Reviews Vol. 191, 1-4, 2015. ISBN 978-1-4939-3549-9.

Volume 55: Remote Sensing and Water Resources
A. Cazenave, N. Champollion, J. Benveniste, and J. Chen (eds.), ISSI Workshop held in October 2014, published in May 2016. Reprinted from Surveys in Geophysics Vol. 37, Issue 2, 2016. ISBN 978-3-319-32448-7.

Forthcoming Volumes in Press or Preparation

Volume 56: The Disk in Relation to The Formation of Planets And Their Protoatmospheres
M. Blanc et al. (eds.), ISSI Beijing Workshop held in August 2014, to be published in 2016.

Volume 57: Solar Magnetic Fields
R. von Steiger et al. (eds.), ISSI Workshop held in January 2015, to be published in 2016.

Volume 58: Integrative Study of the Mean Sea Level and its Components
A. Cazenave et al. (eds.), ISSI Workshop held in February 2015, to be published in 2016.

Volume 59: Dust Devil on Mars and Earth
J. Zarnecki et al. (eds.), ISSI Workshop held in February 2015, to be published in 2016.

Volume 60: The Sources of the Earth's Magnetic Field
C. Stolle, N. Olsen et al. (eds.), ISSI Workshop held in May 2015, to be published in 2016.

Volume 61: Gamma Ray Bursts
D. Götz, M. Falanga et al. (eds.), ISSI Beijing Workshop held in April 2015, to be published in 2017.

Volume 62: Jets and Winds in Pulsar Wind Nebulae, Gamma-ray Bursts and Blazars: Physics of Extreme Energy Release
A. Bykov et al (eds.), ISSI Workshop held in November 2015, to be published in 2017.

Volume 63: High Performance Clocks, with Special Emphasis on Geodesy and Geophysics and Applications to Other Bodies of the Solar System
R. Rodrigo et al. (eds.), ISSI / HISPAC Workshop held in December 2015, to be published in 2017.

Volume 64: The Delivery of Water to Proto-planets, Planets and Satellites
M. Blanc et al. (eds.), Workshop held in January 2016, to be published in 2017.

Volume 65: Shallow Clouds and Water Vapor, Circulation and Climate Sensitivity
A. Cazenave et al. (eds.), ISSI Workshop held in February 2016, to be published in 2017.

ISSI Scientific Reports Series (SR)

Published Volumes

Electronic copies are available from the website www.issibern.ch (go to 'Publications'). Hard copies of volumes 1-8 are available from www.spacebooks-online.com (go to 'ESA-sponsored Publications'). Volumes 9-11 can be ordered on www.springer.com.

Volume 1: Analysis Methods for Multi-Spacecraft Data
G. Paschmann, P.W. Daly (eds.), Results of an ISSI-Working Group, published in July 1998. ISBN 1608-280X.

Volume 2: The Radiometric Calibration of SOHO
A. Pauluhn, M.C.E. Huber, R. von Steiger (eds.), Results of an ISSI-Working Group, published in August 2002. ISBN 1608-280X.

Volume 3: The Solar System and Beyond – Ten Years of ISSI
J. Geiss, B. Hultqvist (eds.). Published on the occasion of ISSI's ten-year anniversary in June 2005. ISBN 1608-280X.

Volume 4: Heat and Gas Diffusion in Comet Nuclei
W.F. Huebner, J. Benkhoff, M.-T. Capria, A. Coradini, C. De Sanctis, R. Orosei, D. Prialnik (eds.), Results from an ISSI-Team, published in August 2006. ISBN 1608-280X.

Volume 5: The Physics of the Heliospheric Boundaries
V.V. Izmodenov, R. Kallenbach (eds.), Results from an ISSI-Team, published in 2006. ISBN 1608-280X.

Volume 6: Planetary Systems and Planets in Systems
S. Udry, W. Benz, R. von Steiger (eds.), Results of an ISSI-Workshop, published in 2006. ISBN 978-92-9221-935-2.

Volume 7: Calibration of Particle Instruments in Space Physics
M. Wüest, D.S. Evans, R. von Steiger (eds.), Results of an ISSI-Working Group, published in December 2007. ISBN 987-92-9221-936-9.

Volume 8: Multi-Spacecraft Analysis Methods Revisited
G. Paschmann, P.W. Daly (eds.), Results of an ISSI-Working Group, published in April 2008. ISBN 987-92-9221-937-6.

Volume 9: Observing Photons in Space – A Guide to Experimental Space Astronomy
M.C.E. Huber, A. Pauluhn, J.L. Culhane, J.G. Timothy, K. Wilhelm, A. Zehnder (eds.), Results of an ISSI-Working Group, published in September 2010, ISBN 978-92-9221-938-3. Second Edition published in 2013, ISBN 978-1-4614-7803-4.

Volume 10: Monitoring Atmospheric Water Vapour – Ground-Based Remote Sensing and In-situ Methods
N. Kämpfer (eds.), Results of an ISSI International Team, published in 2012. ISBN 978-1-4614-3908-0.

Volume 11: Towards Understanding the Climate of Venus – Applications of Terrestrial Models to Our Sister Planet
L. Bengtsson, R.-M. Bonnet, D. Grinspoon, S. Koumoutsaris, S. Lebonnois, D. Titov (eds.), Results of an ISSI-Working Group, published in 2012. ISBN 978-1-4614-5063-4.

Volume 12: Physics of Collisionless Shocks – Space Plasma Shock Waves
A. Balogh, R.A. Treumann, published in 2013. ISBN 978-1-4614-6098-5.

Volume 13: Cross-Calibration of Far UV Spectra of Solar System Objects and the Heliosphere
E. Quémerais, M. Snow, R.-M. Bonnet (eds.), Results of an ISSI-Working Group, published in 2013. ISBN 978-1-4614-6383-2.

Forthcoming Volume in Press

Volume 14: Inventing a Space Mission – The Herschel Space Observatory
V. Minier, R.-M. Bonnet, V. Bontems, T. de Graauw, M. Griffin, F. Helmich, G. Pilbratt, S. Volonté (eds.), Results of an ISSI-Working Group, to be published in 2016.

The SPATIUM magazine containing the lectures of the Association Pro ISSI in a form that is easily understandable by using attractive visual information. For hard copies of the SPATIUM volumes please contact pro-issi@issibern.ch. Electronic editions in PDF format can be downloaded from www.issibern.ch under 'Publications'.

No. 1: *Die ersten Minuten und das weitere Schicksal des Universums*, by Johannes Geiss, published in April 1998.
No. 2: *Das neue Bild der Sonne* (out of print), by Rudolf von Steiger, published in November 1998.
No. 3: *Birth, Age and the Future of the Universe*, by Gustav Andreas Tammann, published in May 1999.
No. 4: *Kometen als Schwerpunkt der europäischen Weltraumforschung*, by Kathrin Altwegg, published in October 1999.
No. 5: *Earth, Moon and Mars* (out of print), by Johannes Geiss, published in June 2000.
No. 6: *From Dust to Planets*, by Willy Benz, published in October 2000.
No. 7: *In Search of the Dark Matter in the Universe*, by Klaus Pretzl, published in May 2001.
No. 8: *Sun and Climate*, by Jürg Beer, published in November 2001.
No. 9: *The Fourfold Way Through the Magnetosphere: The Cluster Mission*, by Götz Paschmann, published in June 2002.
No. 10: *Satellite Navigation Systems for Earth and Space Sciences*, by Gerhard Beutler, published in June 2003.
No. 11: *Cosmic Rays*, by Hansjörg Schlaepfer, published in November 2003.
No. 12: *Ten Years Hubble Space Telescope*, by Roger-Maurice Bonnet, published in June 2004.
No. 13: *Woher kommen Kohlenstoff, Eisen und Uran?*, by Rudolf von Steiger, published in October 2004.
No. 14: *Grundlagen der Physik im extraterrestrischen Test*, by Martin C.E. Huber, published in June 2005.
No. 15: *Titan and the Huygens Mission*, by Nicolas Thomas, published in November 2005.
No. 16: *Astrobiology*, by Oliver Botta, published in July 2006.
No. 17: *The Heliosphere: Empire of the Sun*, by André Balogh, published in October 2006.
No. 18: *Einstein in Bern: The Great Legacy*, by Thomas H. Zurbuchen, Rudolf von Steiger, and Brian Grimm, published in February 2007.
No. 19: *4440: A Secret Number in Astronomy*, by Giovanni Fabrizio Bignami, published in August 2007.
No. 20: *What the Universe Consists of: From Luminous to Dark Matter and Quintessence*, by Uwe-Jens Wiese, published in November 2007.
No. 21: *The Earth's Ozone Layer*, by Yasmine Calisesi, published in February 2008.
No. 22: *Solar Magnetism – Discovery and Investigation*, by Eugene Parker, published in August 2008.
No. 23: *Meteorites*, by Beda Hofmann, published in February 2009.
No. 24: *Cosmic Vision*, summary of a talk by David Southwood edited by Hansjörg Schlaepfer, published in February 2010.
No. 25: *Climate Change*, by Thomas Stocker, published in July 2010.
No. 26: *Spaceship Earth*, by Roger-Maurice Bonnet, published in May 2011.
No. 27: *Science First*, by Hansjörg Schlaepfer, published in September 2011.
No. 28: *How Black are Black Holes?*, by Maurizio Falanga, published in December 2011.
No. 29: *Mysterious Mercury*, by Peter Wurz, published in May 2012.
No. 30: *Planets and Life*, by Tilman Spohn, published in October 2012.
No. 31: *Earth Gravity From Space*, by Reiner Rummel, published in May 2013.
No. 32: *Mirages in the Universe*, by Georges Meylan, published in November 2013.
No. 33: *Pluto and Its Cohorts*, by Hermann Boehnhardt, published in March 2014.
No. 34: *How Earth Observation and Super-Computers Have Made Global Weather Prediction Possible* by Lennart Bengtsson, published in October 2014.
No. 35: *Volcanism in the Solar System*, by Ralf Jaumann, published in May 2015.
No. 36: *Origin and Evolution of Planetary Atmospheres*, by Helmut Lammer, published in November 2015.
No. 37: *The Violent Universe,* by Thierry Courvoisier, published in May 2016.

ISSI Publications in the 21st Business Year

Helioseismology and Dynamics of the Solar Interior

edited by

M.J. Thompson, High Altitude Observatory, Boulder, USA

A.S. Brun, Service d'Astrophysique, CEA-Saclay, France

J.L. Culhane, University College London, Dorking Surrey, UK

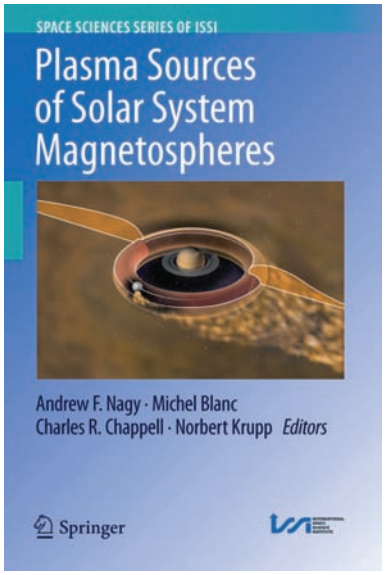
L. Gizon, MPI für Sonnensystemforschung, Göttingen, Germany

M. Roth, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany

T. Sekii, National Astronomical Obs. of Japan, Tokyo, Japan

Volume 48 resulting from an ISSI-Workshop, published in 2016, Space Science Series of ISSI (SSSI).

Table of Contents



Plasma Sources of Solar System Magnetospheres

edited by

Andrew F. Nagy, University of Michigan, Ann Arbor, USA

Michel Blanc, International Space Science Institute, Bern, Switzerland

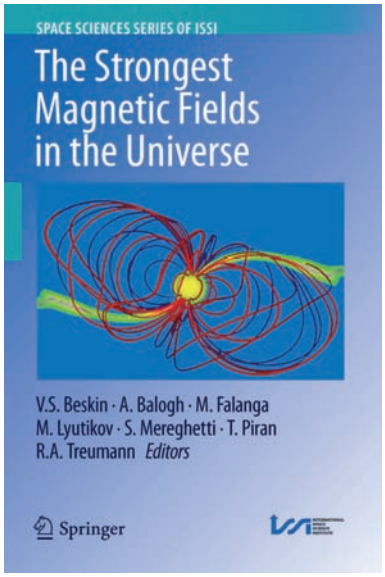
Charles R. Chappell, Vanderbilt University, Nashville, USA

Norbert Krupp, Max Planck Institut für Sonnensystem, Göttingen, Germany

Volume 52 resulting from an ISSI Workshop, published in 2016, Space Science Series of ISSI (SSSI). ISBN 978-1-4939-3543-7.

Table of Contents

ISSI Publications in the 21st Business Year



The Strongest Magnetic Fields in the Universe

edited by

V.S. Beskin, Russian Academy of Sciences, Moscow, Russia

A. Balogh, The Blackett Laboratory, Imperial College London, London, UK

M. Falanga, International Space Science Institute, Bern, Switzerland

M. Lyutikov, Purdue University, West Lafayette, USA

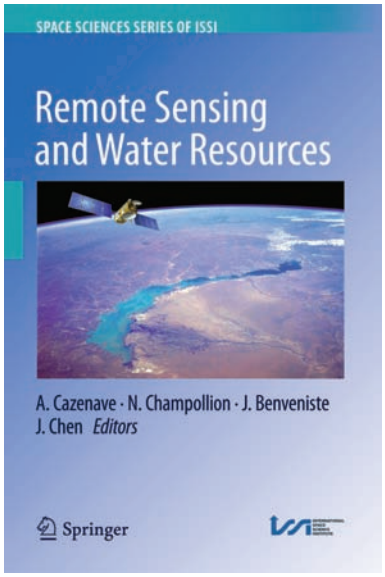
S. Mereghetti, INAF-IASF Milano, Milano, Italy

T. Piran, Racah Institute for Physics, The Hebrew University, Jerusalem, Israel

R.A. Treumann, International Space Science Institute, Bern, Switzerland

Volume 54 resulting from an ISSI Workshop, published in 2016, Space Science Series of ISSI (SSSI), ISBN 978-1-4939-3549-9.

Table of Contents



Remote Sensing and Water Resources

edited by

A. Cazenave, International Space Science Institute, Bern, Switzerland

N. Champollion, International Space Science Institute, Bern, Switzerland

J. Benveniste, European Space Agency, Frascati, Italy

J. Chen, Center for Space Research, University of Texas at Austin, USA

Volume 55 resulting from an ISSI Workshop, published in 2016, Space Science Series of ISSI (SSSI), ISBN 978-3-319-32448-7.

Table of Contents

International Space Science Institute ISSI
Hallerstrasse 6
CH-3012 Bern
Switzerland
Tel. +41 31 631 48 96
www.issibern.ch
info@issibern.ch